DRAFT Integrated Overflow Control Plan (IOCP)

Unified Government of Wyandotte County and Kansas City, Kansas

Integrated Overflow Control Program

September 27, 2016

Index and Certification

Unified Government of Wyandotte County and Kansas City, Kansas
Integrated Overflow Control Plan (IOCP)

Report Index

Certification

Unified Government of Wyandotte County and Kansas City, Kansas
Integrated Overflow Control Plan

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: ______________________

Title: INTERIM DIRECTOR

Date: SEPTEMBER 15, 2016

TABLE OF CONTENTS

Appendices

List of Tables

List of Figures

List of Abbreviations

Abbreviation	Term/Phrase/Name
ABS	acrylonitrile butadiene styrene
ac	acres
ACS	American Community Survey
ADF	average daily flow
AID	Armourdale Industrial District
BEACH	Beaches Environmental Assessment and Coastal Health
BFP	belt filter press
BMP	best management practice
BNR	biological nutrient removal
BOD	biological oxygen demand
BPU	Board of Public Utilities
CAFR	Comprehensive Annual Financial Report
ccf	hundred cubic feet
CCTV	closed circuit television
CES	chemically enhanced settling
cfs	cubic feet per second
CFU	colony forming units
CID	Central Industrial District
CIP	cast iron pipe
CIPP	cured-in-place pipe
CMIP	Capital Maintenance and Improvement Plan
CMMS	computerized maintenance management system
CMOM	capacity, management, operation, and maintenance
CMP	corrugated metal pipe
CPH	cost per household
CPI	Consumer Price Index
CSO	combined sewer overflow
CSRRP	Collection System Release Response Plan

Abbreviation	Term/Phrase/Name
CSS	combined sewer system
CWA	Clean Water Act
CY	cubic yard
dia	diameter
DIP	ductile iron pipe
DO	dissolved oxygen
DOJ	Department of Justice
E. coli	*Escherichia* coli
EFDC	Environmental Fluid Dynamics Code
EFHB	excess flow holding basin
EJ	environmental justice
ELA	engineering, legal, and administration
ENR	enhanced nutrient removal
ENRCCI	Engineering News Record Construction Cost Index
EPA	Environmental Protection Agency
ERU	equivalent residential unit
FCA	financial capability assessment
FCI	financial capability indicator
FID	Fairfax Industrial District
FM	force main
FOG	fats, oils, and grease
fps	feet per second
ft	feet
gal	gallon
GIS	geographic information system
GM	General Motors
GO	general obligation
gpd	gallons per day
gpm	gallons per minute
HDPE	high density polyethylene

Abbreviation	Term/Phrase/Name
HLR	hydraulic loading rate
HMI	human machine interface
hp	horsepower
HPO-AS	high purity oxygen activated sludge
HRC	high rate clarification
HRF	high rate filtration
HRT	high rate treatment
HUC	Hydrologic Unit Code
HVAC	heating, ventilation, and cooling
IBEW	International Brotherhood of Electrical Workers
I/I	infiltration and inflow
IMS	Information Management System
in	inch
IOCP	Integrated Overflow Control Plan
K.A.R.	Kansas Administrative Regulations
KCK	Kansas City, Kansas
KCMO	Kansas City, Missouri
KDHE	Kansas Department of Health and Environment
KS	Kansas
lb	pound
LEL	lower explosive limit
LF	linear feet
LTCN	Little Turkey Creek North
LTCP	long-term control plan
LTTN	Little Turkey Tributary North
MARC	Mid-America Regional Council
MCC	motor control center
MCM	minimum control measure
MEP	maximum extent practicable
MG	million gallons

Abbreviation	Term/Phrase/Name
mgd	million gallons per day
mg/L	milligrams per liter
MHI	median household income
MIT	minimum inter-event time
mL	milliliter
mL/g	milliliters per gram
MLSS	mixed liquor suspended solids
mm	millimeter
MO	Missouri
MoDNR	Missouri Department of Natural Resources
MS4	municipal separate storm sewer system
NA	not applicable
NAACP	National Association for the Advancement of Colored People
NASSCO	National Association of Sewer Service Companies
NEMA	National Electrical Manufacturers Association
NMC	nine minimum controls
No.	Number
NPDES	National Pollutant Discharge Elimination System
OCP	Overflow Control Program
O&M	operation and maintenance
PACP	Pipeline Assessment Certification Program
PCB	polychlorinated biphenyl
PCCP	prestressed concrete cylinder pipe
PCD	Partial Consent Decree
PCR	primary contact recreation
PE	polyethylene
POTW	publically-owned treatment works
PS	pump station
psi	pounds per square inch
psig	pounds per square inch gauge

Abbreviation	Term/Phrase/Name
PVC	polyvinyl chloride
RAS	return activated sludge
RCB	reinforced concrete box
RCP	reinforced concrete pipe
RI	Residential Indicator
rpm	revolutions per minute
SCADA	supervisory control and data acquisition
scfm	standard cubic feet per minute
SCR	secondary contact recreation
sf	square feet
SMP	Stormwater Management Plan
SOP	standard operating procedure
S&P	Standard & Poor's
sq	square
SRF	State Revolving Fund
SRS	Structural Risk Score
SSE	Sewer System Evaluation
SSES	sanitary sewer evaluation study
SSO	sanitary sewer overflow
SSS	separate sewer system
STV	statistical threshold valve
SVI	sludge volume index
SW	stormwater
TDH	total dynamic head
TM	technical memorandum
TMDL	total maximum daily load
TN	total nitrogen
TP	total phosphorus
TSS	total suspended solids
UG	Unified Government of Wyandotte County and Kansas City, Kansas

Abbreviation	Term/Phrase/Name
URL	Uniform Resource Locator
USACE	United States Army Corps of Engineers
USD	Unified School District
USGS	United States Geological Survey
UV	ultraviolet
V	volts
VCP	vitrified clay pipe
VFD	variable frequency drive
WAS	waste activated sludge
WBC	whole body contact
WLA	waste load allocation
WPCD	Water Pollution Control Division
WQS	water quality standard
WRDA	Water Resources Development Act
WWT	wastewater treatment
WWTP	wastewater treatment plant
WyCo	Wyandotte County
XFMR	Transformer

PLAN OVERVIEW

Summary

Pursuant to federal mandate, the Unified Government of Wyandotte County and Kansas City, Kansas (UG) has prepared a sewer system Integrated Overflow Control Plan (IOCP). The IOCP is designed to comply with federal requirements in a manner that meets goals supported by the UG's stakeholders: protect human health, public safety, and customer property and make continued progress towards improving water quality. As required by a 2013 Partial Federal Consent Decree, in addition to developing and evaluating sewer overflow control options, the UG assessed the condition and operation of their sewer system infrastructure and identified significant repair, rehabilitation, and upgrade needs. Due to financial limitations of the economically disadvantaged UG rate paying community, initial investments will necessarily target continued repair and renewal of the existing sewer system and the construction of critically important early action projects. Such projects will preserve existing assets and deliver the greatest possible benefits from critical early program dollars. The overall IOCP will require several decades to implement and must feature an iterative/adaptive process to ensure that it reflects the most affordable, cost-effective, and beneficial approaches.

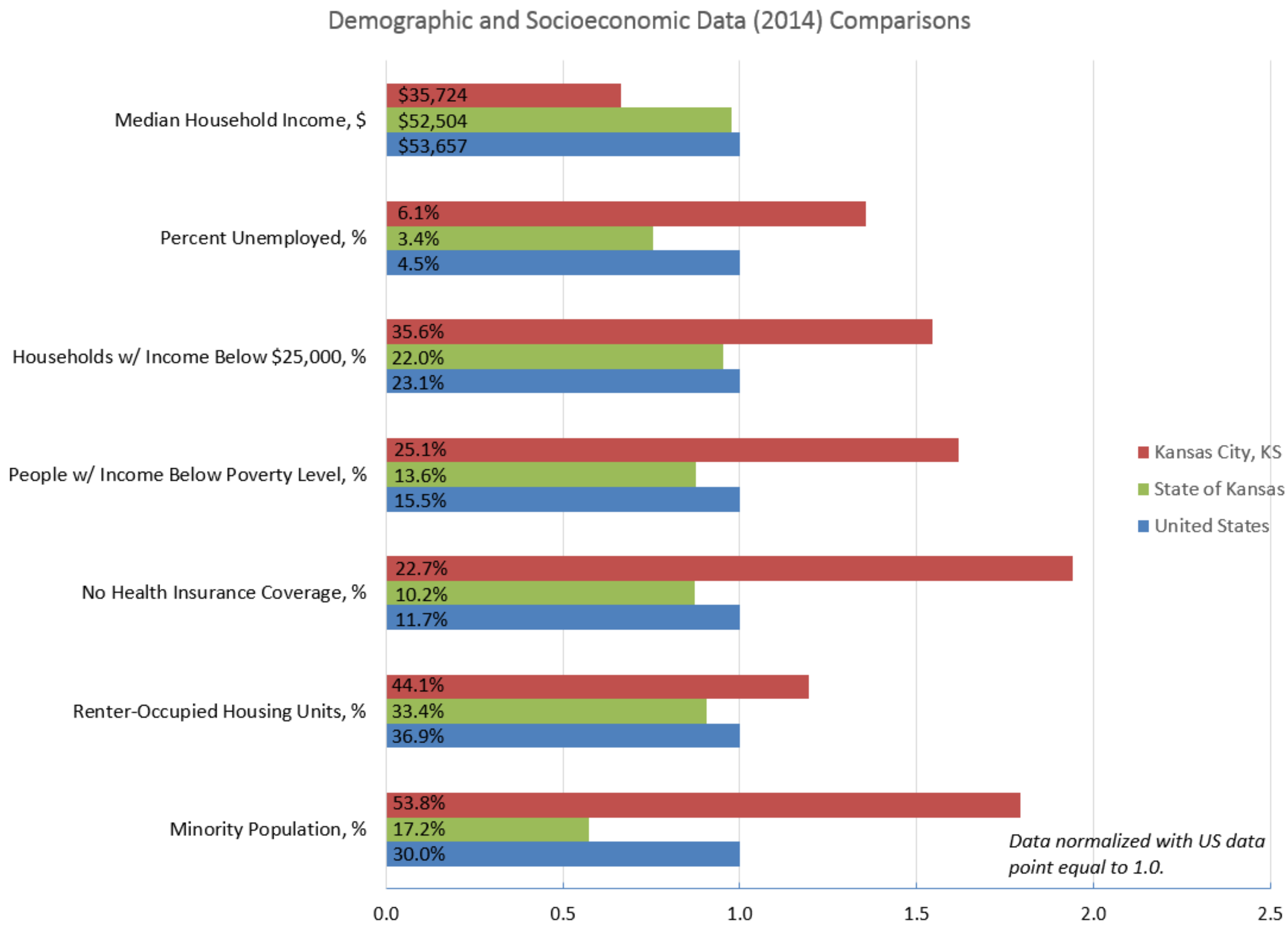
Over the course of the next decade, the UG is committed to an aggressive $200 million plan that reinvests available revenue in the higher priority existing sewer system improvements, makes continued overflow reduction progress, and allows time to grow the capability of the utility to implement and revise the overall IOCP. Once the existing system is renewed to a more sustainable condition and the early action projects are completed, the UG will reevaluate the community's financial capability, the benefits that have been achieved, and the identified goals and priorities to achieve additional sewer overflow reduction and water quality improvements. The additional controls will be submitted to the agencies in a final measures plan for approval. The recommended plan addresses the goals and priorities of local stakeholders including significant progress on system renewal, is an aggressive financial commitment and burden on the community, and reduces combined and separate sewer overflow volumes by 20% and 85%, respectively.

Introduction

The UG Water Pollution Control Division (WPCD) currently provides sewer service and local stormwater management to approximately 44,000 customers (approximately 150,000 residents) within Wyandotte County, Kansas. This relatively small rate base must support the operation and maintenance of a complex sewer system consisting of approximately 1,100 miles of combined and separate sanitary and storm sewer pipelines, five wastewater treatment plants (WWTPs), 71 wastewater pump stations, nine flood pump stations, as well as support local drainage districts that maintain almost 20 miles of flood control levees.

About 16% of the approximately 160 square mile UG service area is served by a combined sewer system (CSS). The remaining 84% of the service area is served by a separate sewer system (SSS). There are also significant areas within the county that are currently not served by sanitary sewers. During some wet weather events, both combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs) may result in sewage diluted with stormwater being discharged into the environment and potentially into one of four CSO receiving water bodies: Missouri River, Kansas River, Jersey Creek, and Mattoon Creek.

Residents in the UG service area are disadvantaged compared to the state and national populations for a number of key socioeconomic metrics, including median household income, unemployment, and the portion of the population living below the poverty level. In the State of Kansas, Wyandotte County residents have the lowest per capita income, highest rate of unemployment, and lowest overall health ranking compared to the remaining 104 Kansas counties. The financial reality of the service area creates substantial challenges to fund the utility adequately while maintaining tolerable rate burdens.



Kansas City, Kansas, residents are disadvantaged compared to the state and national populations for a number of key socioeconomic metrics.

Magnifying these challenges, there has recently been an unprecedented loss of management experience within the utility. Several key long-term senior staff have retired or left the organization since the Partial Consent Decree (PCD) was issued, including the Public Works Director, WPCD Director, Kaw Point WWTP Plant Manager, County Engineer, and an experienced staff engineer. The utility has also experienced the loss of several experienced senior operators and maintenance staff during this time with several key retirements pending over the course of the next several years. These individuals have significant institutional knowledge related to the wastewater system and replacing them has proven to be difficult with several key positions still open. The staffing reality continues to make PCD compliance difficult and will exacerbate the already significant challenge of implementing the IOCP.

Early Progress (Pre-Partial Consent Decree)

Despite significant financial challenges, since 2000 the UG spent tens of millions of dollars on sewer separation projects and WWTP and pump station capacity improvement projects. Considerably more funds were spent to inspect, upgrade, and renew the sewer system infrastructure. These improvements reduced the number of CSO diversion structures from 66 to 48 and are estimated to have reduced annual CSO overflow volume by almost 20%.

The 16 years of water quality and system reliability improvements since the year 2000 have required aggressive annual wastewater user rate increases between 3% and 15%, resulting in the average annual sewer and stormwater bill for served households being 1.23% of the community-wide median household income (MHI) in 2014, one common metric used by the EPA to assess a community's capability to implement overflow controls. Households in the second and lowest quintiles are paying 2.08% and 5.95% of their MHI, respectively. These are significant burdens for highly vulnerable populations that must be considered rather than focusing solely on median household impacts.

Partial Consent Decree Early Action Projects and Programs

After several years of negotiations with the U.S. Environmental Protection Agency (EPA) and the Kansas Department of Health and Environmental (KDHE), the UG entered into a federal PCD in March 2013. The major requirement of the PCD is the development of an IOCP, i.e., a comprehensive plan to upgrade the UG's sewer system to address sewer overflows. In order to inform and prepare the plan, the PCD required the UG to perform several underlying tasks and studies including:

- Perform sewer system infrastructure condition assessments.
- Characterize the existing physical characteristics and capacity of the sewer system through field inspections, monitoring, and hydraulic modeling.
- Characterize receiving water quality and CSO impacts.
- Perform a financial capability assessment.
- Implement a public participation program.

The PCD also required the UG to construct a number of major capital projects to improve operations at the Kaw Point WWTP (the largest WWTP in the system) located at the confluence of the Kansas and Missouri Rivers, rehabilitate pump stations, and repair numerous sewers with known structural deficiencies. These projects included biosolids dewatering improvements to meet air quality regulations and construction of a disinfection facility to reduce effluent bacteria concentrations into the Missouri River. The identified sewer projects repaired pipes that were known to be at risk of structural failure and contributed to capacity limitations of the sewer system. These projects required substantial investments (totaling over $35 million in construction, engineering, and other costs) with the result being reduction in bacteria loadings to the Missouri River and enhanced WWTP reliability.

The new $6 million ultraviolet disinfection facility has reduced typical bacteria concentrations in sampled plant effluent to the Missouri River from over 50,000 to a monthly geometric mean typically less than 100 counts per 100 mL.

Concurrently, the UG implemented and enhanced several programs designed to improve system operation and performance. These programs and processes were designed to reduce the amount of fats, oil, and grease (FOG) entering the system; improve response to system overflows to reduce impacts; update utility-wide information management systems; and improve capacity, management, operations, and maintenance (CMOM) activities to improve system performance and reduce overflows.

The WPCD has increased the annual quantity of maintenance activities performed internally, but also are performing these activities more effectively by using geographic information systems, hydraulic modeling, and mobile field devices.

The UG has increased sewer utility funding, staffing, and program implementation effort in response to the PCD. To date, the UG has met all PCD required deadlines and in almost every instance done more than was required. These accomplishments are all the more significant given the unprecedented loss of institutional knowledge and associated staff turnover in recent years.

Sewer System Infrastructure Condition Assessment

The PCD acknowledged that the condition of the sewer system infrastructure was a fundamental concern and exacerbated the volume and frequency of system overflows. Reliability of the existing infrastructure not only impacts human health, public safety, and property, but in the SSS it also has a real impact on water quality as evidenced by a recent overflow caused by a pipe failure and worsened by a malfunctioning pump station valve. In addition, a majority of the collection system is over 50 years old largely composed of vitrified clay pipe beyond its intended service life. System reliability concerns have been determined to be so critical that local stakeholders have identified renewal of the existing system as the highest priority of the IOCP.

Accordingly, the UG has put increased focus on the investigation and condition and operation assessment of a large portion of their sewer system infrastructure including WWTPs, pump stations, and combined and separated collection system piping (including those considered high risk due to streambank erosion). As part of an integrated approach to maximize the benefits from the UG’s limited resources, investigations of the storm sewer system and flood control pump stations are also planned due to their potential impact on human health, public safety, and customer property.

Initial condition assessment efforts have identified substantial infrastructure upgrade, renewal, operation, and maintenance needs necessary to maintain and improve system reliability. Degradation of the existing infrastructure beyond its useful life has occurred over a half century. As a result, sustainable renewal of the system will require directing more funds to the effort than has historically been allocated and applying a logical, long-term approach that moves the utility from a reactive to a more proactive position.

Sewer System and Water Quality Characterization

Completed in 2015, the CSS characterization identified a detailed plan of system improvements and corresponding costs to address CSOs at various levels of control. As previously indicated, sewer separation, and capacity improvements have been made to reduce CSOs since 2000. Although this work has resulted in CSO outfall and overflow volume reduction in the eastern areas of the county, additional improvements are necessary to achieve more stringent levels of control. Capital improvements in the CSS to achieve 12 and zero overflows per typical year levels of control were estimated to cost approximately $200 million and $980 million, respectively. These improvements include combinations of conveyance and pump station capacity improvements, storage facilities, and high rate treatment. This does not include costs for necessary infrastructure renewal and upgrade, SSO control, or program implementation.

Similarly in 2015, the SSS characterization identified improvements necessary to address SSOs. Capital improvements in the SSS to achieve two-year and five-year levels of service were estimated to cost $85 million and $116 million, respectively. These improvements, in the western two-thirds of the county, include expansion of the Wolcott WWTP; gravity sewer, force main, and pump station capacity improvements; and storage facilities. These costs are on top of costs for necessary infrastructure renewal and upgrade, CSO control, or program implementation.

In conjunction with the sewer system characterization effort, receiving water quality was monitored and modeled to establish baseline conditions and evaluate the impacts of overflows on the attainment of water quality standards and uses. This effort concluded that water quality standards and uses cannot consistently be met in some receiving waters due to pollution sources other than CSOs. The demonstration approach (as defined in the *CSO Control Policy*) is met in Jersey Creek under existing conditions, i.e., no additional CSO control is necessary. The recreation season geometric mean of 262 CFUs per 100 mL is also met in the Kansas and Missouri Rivers under existing conditions when upstream source contributions are controlled to levels meeting the applicable standards. Mattoon Creek is currently designated as a Primary Contact Recreation stream, and should be characterized as a Secondary Contact Recreation stream. CSO control in Mattoon Creek results in no discernible improvement.

Even elimination of all CSOs (at a cost of almost $1 billion) would not result in attainment of water quality standards in the Missouri and Kansas Rivers.

Financial Capability Assessment

Utilizing the EPA's 1997 guidance, an initial assessment was performed to evaluate the financial resources the UG has available to implement additional CSO and SSO controls. To achieve the levels of control identified in the characterization effort within a 25-year timeframe, a "high" financial impact to the already heavily burdened population would result. To meet even a 12 overflow events per typical year level of CSO control and two-year design storm level of SSO service, the cost per household as a percentage of the community-wide MHI would be 2.9%. The assessment found that the burden and level of debt required to meet this level of control would be unacceptable and unsustainable.

Wastewater and stormwater user rates are not the only burdens on this economically disadvantaged community. Consider the following:

- Between 2010 and 2013, base rates for electric and water services have each increased 7 to 8% annually.

Recent electric rate increases were primarily required to fund $250 million in improvements at the 235 megawatt (MW) Nearman Power Plant in order to comply with EPA air emission standards, further burdening the community ratepayers.

- Many residents in the CSS area also pay a mill levy to fund drainage districts that provide flood control protection.
- The current property tax burden in Wyandotte County is 1.858% of assessed home value compared to 1.410% and 1.211% in the state and nation, respectively.
- Due to the extremely high number of vacant properties in the urban CSS area, there are fewer ratepayers per unit of sewer infrastructure to help fund system maintenance and renewal.

"*Allow me to address the blight. To understand the breadth of the problem, consider that 50 years ago, Wyandotte County had a population of 185,000. Over the next three decades, we lost nearly 30,000 people, largely due to "white flight." Fortunately, many new residents, mostly immigrants, have moved to our community, which has helped stabilize our population. Nevertheless, that initial exodus left behind roughly 10,000 empty homes and 6,000 vacant lots.*" Kansas City, Kansas, Mayor Mark Holland, June 22, 2016

In addition to heavily burdening the ratepayers, the utility would experience an unacceptable and unsustainable debt level and risk losing significant revenue bases if higher levels of control/service were implemented over a 25-year period. The UG is already one of the highest debt burden per capita communities in Kansas. It is well known that addressing CSOs is a national concern that can severely financially affect communities and recent CSO consent decree extensions related to financial capability reinforce this fact. For example, locally Johnson County, Kansas, and Liberty, Missouri, (two significant Kansas City, Missouri [KCMO] wholesale customers) have decided to move forward with new/expanded WWTPs partially in response to the higher rates being charged by KCMO to comply with consent decree-mandated overflow control requirements. This resultant reduction in customer base will further burden the KCMO community, another disadvantaged community that is experiencing financial difficulties associated with addressing CSOs.

The UG's proposed plan to address overflows is profoundly constrained by the community's capability to pay for the necessary improvements. Increasing the typical residential sewer rates to approximately 1.9% of the projected community-wide MHI is considered the upper level of burden achievable over the next 10 years due to the economic disadvantages already incurred by the community and the impact on the population already living below the poverty level. The underlying rate increases will generate approximately $12 million annually for debt and cash funding for capital improvements.

Separate Sewer System Master Plan

The UG has worked diligently to strengthen the local economy, improve the quality of life, and increase the tax base of the community. These efforts have resulted in population shift/growth in the western areas of the service area. Recent 20-year projections by the planning department indicate the sewered population in this western area may double. Based on these projections, a master plan for the western third of the service area was prepared to identify improvements to meet increasing service demands of the anticipated growth, but also to further efforts to address sewer overflows.

The master planning effort determined that the existing Wolcott WWTP in the SSS is very near its design capacity. Expansion of the Wolcott WWTP is needed by 2020 to accommodate projected growth/population shifts. Most importantly, these facilities are needed to expand the rate base to pay for needed investment in the existing system. At the same time, due to capacity restrictions a majority of the system SSOs occur upstream of Plant 20, also located in the SSS. Plant 20; however, serves a major portion of the Wolcott WWTP's natural watershed. Fortuitously, it was determined that decommissioning Pump Station 50 and redirecting flow by gravity to a new Wolcott WWTP reduces flow in the Plant 20 tributary area, which in turn will substantially reduce SSOs. At an estimated cost of $33 million, these projects will:

- Substantially reduce SSO volume.
- Reduce capital needs for Plant 20 expansion.
- Meet National Pollutant Discharge Elimination System (NPDES) Permit effluent requirements.
- Reduce the nutrient load to the Kansas River.
- Address future service needs (and increase the ratepayer base to fund additional improvements).

The existing Wolcott WWTP (an interim package plant installed in 2009) has nearly reached its design treatment capacity, and has experienced recurring wet weather effluent discharge violations. It will be unable to meet future effluent ammonia limitations.

Additional Challenges and Unknowns

The UG faces a number of challenges to meet CWA requirements and improve water quality. The UG is committed and has begun to aggressively make progress on improving infrastructure reliability and reducing overflows. However, there are numerous uncertainties that cloud the anticipated effectiveness, schedule, and costs of planned improvements. These uncertainties require a recommended plan that is flexible and adaptive. Committing to a 20-year or longer plan is unwise and impractical for the UG and its ratepayers. Key uncertainties, which support this conclusion, include:

- The timing and magnitude of future regulatory compliance requirements, such as nutrient removal at the WWTPs and Municipal Separate Storm Sewer System (MS4) Permit requirements to address total maximum daily loads (TMDLs), are unclear.

Compliance with nutrient removal regulations is anticipated to cost over $90 million at the Kaw Point WWTP. Nutrient removal facilities would also be required at Plant 20.

- Effectiveness of overflow reduction related to improvements that are difficult to quantify, such as an enhanced FOG program, CMOM activities, supervisory control, and data acquisition (SCADA) system improvements, green infrastructure, and infiltration and inflow (I/I) reduction, are uncertain at this time and may affect capital spending.
- Local and regional engineer and construction contractor capacity and availability due to similar sewer system improvement efforts throughout the region are anticipated to result in unquantified (at this time) but likely construction cost escalation.
- Accuracy of current financial assumptions, such as changes in household MHI over time, impacts and degree of rate tolerance, and population growth trends (which have been negative), will affect residential affordability and the UG's ability to generate additional revenue.
- Accuracy of current technical assumptions, such as capital cost estimates, infrastructure renewal costs determined by extrapolation, and wastewater treatment plant wet weather capacity, will affect the magnitude of capital projects.
- Although project costs have been determined based on actual inspections and hydraulic modeling, the amount of infrastructure that has not been inspected and modeled remains significant.

- Kansas City's location at the confluence of two great rivers requires significant funding to maintain the flood control system. Federal flood control levee improvement needs that are defined in a recent U.S. Army Corps of Engineers (USACE) study may exceed $100 million (local share), but the timing and level of commitment are unknown. The magnitude of this obligation will affect residential and utility affordability considerably.
- Local drainage issues that are priority concerns for stakeholders in relation to sewer overflow control due to their impact on public safety and private property.

Consequently, the recommended plan must be flexible and adaptive to ensure that the plan benefits are being achieved, priorities can be reevaluated, and community affordability is not exceeded.

Recommended Plan

The Recommended Plan meets the *CSO Control Policy* demonstration approach for the CSO receiving water bodies. Reducing the occurrence of SSOs and controlling CSOs to a level meeting the *CSO Control Policy* presumption approach, both within a typical 20 to 25 year timeframe is not financially feasible for the UG. The existing wastewater and stormwater infrastructure renewal needs are significant and must be addressed, followed by priority overflow control investments.

As a result of its financial challenges, the UG is proposing a 10-year, $200 million IOCP that focuses resources on infrastructure renewal and priority capital improvement projects. Through these system reliability improvements, additional overflow reduction will be achieved while maintaining sustainable, yet aggressive, annual rate increases. Considerable improvements in the economically disadvantaged CSS area have been made since 2000 despite numerous challenges. The Recommended Plan will build on this progress. The major components of the Recommended Plan are as follows:

<u>Infrastructure Upgrades and Renewal.</u> Addressing the identified renewal needs of the existing wastewater and stormwater infrastructure will increase system reliability and performance. In addition, these improvements will have the benefit of reducing the potential for overflows related to equipment and pipe failure. To maximize limited financial resources, renewal priority will be given to assets that have failed and have higher probability and consequences of failure, including safety improvements to protect utility workers, the public, and property. Secondary priority will be given to projects that restore and upgrade WWTP and pump station capacity and renew pipes and manholes in areas with chronic, recurring SSOs. Examples of these projects include pipe and manhole repairs, rehabilitation of WWTPs and pump stations, providing secondary power at key pump stations, repairing and protecting exposed pipes along streambanks, and addressing stormwater infrastructure repair needs in areas of chronic flooding.

The UG experiences overflows due to various types of infrastructure failures, including collapsed pipe.

Wolcott WWTP Expansion. Replacing the existing 0.288 mgd Wolcott WWTP with a new 2 mgd facility and rerouting flow by gravity with a new interceptor from Pump Station 50 to the new WWTP will provide numerous benefits. These projects will immediately and significantly reduce the volume of SSOs by almost 90% at Pump Station 6 (for the two-year design storm) and improve effluent water quality at Plant 20 by reducing nutrient loads to the Kansas River. These improvements will also delay and decrease the magnitude of capacity improvements at these facilities and eliminate Pump Station 50 operation and maintenance costs. The new facility will be designed to meet more stringent ammonia effluent limits based upon the EPA’s latest national recommendation and implement nutrient controls to comply with the Kansas Nutrient Reduction Plan. The new facility also supports continued population shift to, and much needed, economic development, in the western service area resulting in a larger future customer base.

Operational Improvements and Asset Management. Operational improvements to maximize flow through the WWTPs and continued refinement and enhancement of the Nine Minimum Controls (NMC) and CMOM Programs will reduce the potential for overflows. Continued development of an asset management program will allow the continued evaluation of assets and lead to prioritized renewal of assets based upon probability and consequence of failure rather than reactive repair leading to a more effective and sustainable utility. Increased system investigations and evaluations to determine condition of existing assets to optimize the existing system performance, reduce system failures, and plan future improvements will also be performed.

Kaw Point WWTP Reliability Improvements. Improvements to the UG’s largest WWTP include several operational changes and equipment upgrades and repairs to improve facility reliability and increase wet weather treatment capacity. Several unit processes and equipment, which have experienced service outages, are scheduled for repair including primary clarifiers.

SCADA System Improvements. SCADA system improvements are expected to reduce overflows through monitoring and optimization of the existing system. Monitoring of pump stations and overflow locations allows the WPCD to respond to and reduce the amount of time overflows occur, gather additional information needed to refine technical assumptions and make smarter decisions on future improvements, and measure the overflow reduction achieved by future overflow control efforts. In the CSS, this upgraded technology will allow the UG to better maximize flow to the Kaw Point WWTP. Although difficult to quantify in the short term, the resultant improvement in operations attainable through SCADA system improvements is anticipated to facilitate efforts to reduce overflows over the long run.

Armourdale Basin Targeted Sewer Separation. Targeted sewer separation projects will not only relieve frequent street flooding and renew sewer infrastructure in the area, but also reduce overflow volume and frequency at CSOs 41, 42, 43, 44, 47, 48, and 66. Scheduled sewer separation is anticipated to reduce overflow volume to the Kansas River by 38% in the typical year from these outfalls.

CSO 19 Green Infrastructure. This CSS project will reduce CSO volume and frequency at CSO 19, provide some flood control benefit, and improve the water quality of Big Eleven Lake. An important civic resource, Big Eleven Lake is currently impaired due to increased nutrient loads. The proposed project will reduce nutrients and provide more baseflow to the lake, which will improve water quality. This project is proposed to be integrated into a planned urban redevelopment program that will be highly visible in the downtown district and is anticipated to stimulate urban renewal. Consisting of bioretention, bioswales, wetland forebays, and wetlands, implementing green infrastructure in this basin will provide a great opportunity to showcase different types of green infrastructure and evaluate its performance. It will also be used to estimate the cost of construction, operation, and maintenance for future green infrastructure efforts anticipated to be evaluated during future overflow control evaluations. Achieving this level of control utilizing green in lieu of gray infrastructure will save the community approximately $7 million due to the reduction in size of downstream CSO control facilities. If the planned urban redevelopment plan changes, other green infrastructure projects that can provide equally significant overflow control have been identified and may be substituted for this project identified at CSO 19. We also see this project as an excellent opportunity to educate and engage the public regarding sewer overflow control issues and opportunities.

Plant 20 Capacity Upgrades and Reliability Improvements. Improvements to Plant 20 include increasing the peak flow treatment capacity from 14 mgd to 21 mgd, thereby reducing the volume and frequency of discharges through the Pump Station 6 overflow. Several renewal improvements, including influent screening replacement and new disinfection equipment and controls, are scheduled to increase safety, reliability, and extend the life of the aging facilities.

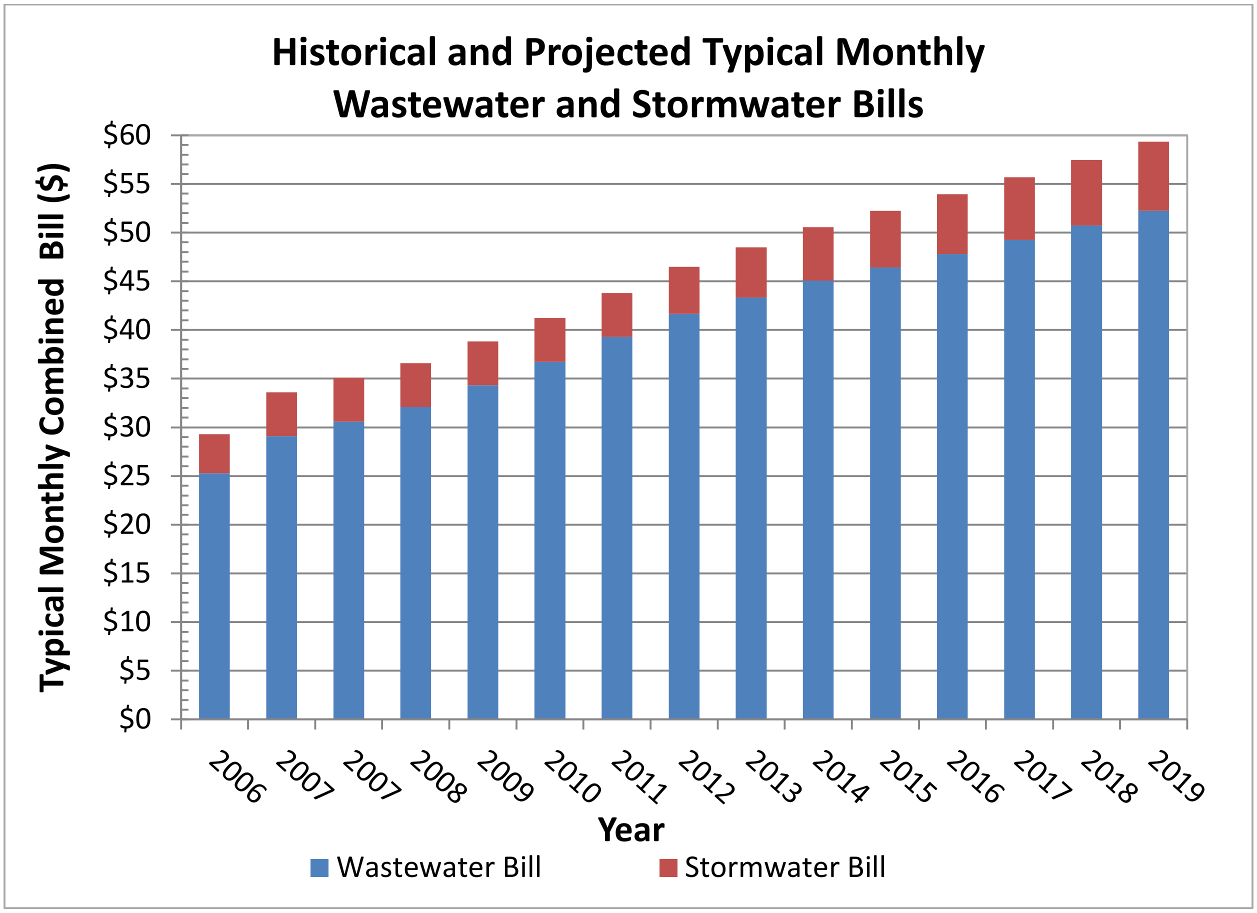
The Recommended Plan:

- Addresses the community’s highest priorities of renewing the existing infrastructure and making progress towards meeting the CWA goals.
- Balances near term public investments and benefits with the UG’s financial capability.
- Represents the best level of overflow control achievable with the available public investment.
- Incorporates input received from local stakeholder groups in 2015 and 2016, including a community task force consisting of local leaders selected by the Mayor and several UG Commissioners.
- Provides for the submission of a final measures plan for agency approval by December 31, 2025.

Financing and Implementation Schedule

The UG spent over $35 million on previous CSO control efforts. This next phase is proposed to be an adaptive 10-year plan (2016 to 2025) that implements the most critical improvements to improve system reliability and performance while also providing overflow control reductions.

This latest aggressive commitment will total approximately $200 million in integrated wastewater and stormwater system capital improvements. It will require the UG to raise sewer user rates and stormwater fees annually up to approximately 1.9% of projected community-wide MHI in year 10. Debt financing will be a key part of the revenue to fund this commitment for projects such as the new, larger capacity Wolcott WWTP. State and/or federal financial assistance will be pursued for the Recommended Plan and the final control measures that will follow.



Proposed rate increases to implement the proposed plan will result in user rates being increased 250% since 2000 when direct overflow control efforts were initiated.

Due to financial and management challenges and uncertainties, the plan must remain flexible and allow the UG time to focus on their existing infrastructure and regather the institutional knowledge and capacity that has recently been lost. After the existing assets are in a more sustainable condition, future efforts, which include an update to this IOCP in year 10 of the Recommended Plan, are anticipated to create an approach to address the remaining overflows and achieve compliance with CWA requirements. The Recommended Plan reflects the input of our stakeholders as well as the financial realities and needs of the UG.

1.0 INTRODUCTION

1.1 Introduction

In accordance with the Partial Consent Decree (PCD) entered into with the United States Environmental Protection Agency (EPA) and the United States Department of Justice (DOJ), the Unified Government of Wyandotte County and Kansas City, Kansas (UG) submits for agency review this draft Integrated Overflow Control Plan (IOCP). This IOCP presents the UG's Recommended Plan to reduce sewage overflows and comply with Clean Water Act (CWA) requirements to renew its sewer system. The IOCP integrates a combined sewer overflow (CSO) long-term control plan (LTCP) and sanitary sewer overflow (SSO) remediation plan with municipal separate storm sewer system (MS4) and infrastructure renewal needs into a long-term capital plan that balances and prioritizes system improvements with available funding.

The IOCP was developed around the following key goals identified early in the planning process by internal stakeholders:

- Protect human health, public safety, and property.
- Meet CWA regulations.
- Protect water quality based on how the community wants to use water resources.

These initial goals formed the basis for developing the IOCP. Accompanying these initial goals were key priorities that the community wanted to achieve with the limited availability of funds:

- Reinvest in the existing system.
- Address chronic, high frequency SSO sites.
- Achieve multiple benefits, e.g., overflow reduction and system renewal.

1.2 Recommended Plan

In response to the PCD, this IOCP is proposed to be a 10-year plan requiring approximately $200 million in capital improvements to the wastewater and stormwater systems. The Recommended Plan contains projects to address system renewal and will achieve notable CSO and SSO volume reductions. This major capital program will include the following:

- <u>Infrastructure Upgrades and Renewal.</u> Addressing the identified renewal needs of the existing wastewater and stormwater infrastructure will increase system reliability and performance. In addition, these improvements will have the benefit of reducing the potential for overflows related to equipment and pipe failure. To maximize limited financial resources, renewal priority will be given to assets that have failed and have higher probability and consequences of failure, including safety improvements to protect utility workers, the public, and property. Secondary priority will be given to projects that restore and upgrade wastewater treatment plant (WWTP) and pump station capacity and renew pipes and manholes in areas with chronic, recurring SSOs. Examples of these projects include pipe and manhole repairs, rehabilitation of WWTPs and pump stations, providing secondary power at key pump stations, repairing and protecting exposed pipes along streambanks, and addressing stormwater infrastructure repair needs in areas of chronic flooding.
- <u>Wolcott WWTP Expansion.</u> Replacing the existing 0.288 million gallons per day (mgd) Wolcott WWTP with a new 2 mgd facility and rerouting flow by gravity with a new interceptor from Pump Station (PS) 50 to the new WWTP will provide numerous benefits. These projects will immediately

and significantly reduce the volume of SSOs by almost 90% at PS 6 (for the two-year design storm) and improve effluent water quality at Plant 20 by reducing nutrient loads to the Kansas River. These improvements will also delay and decrease the magnitude of capacity improvements at these facilities and eliminate PS 50 operation and maintenance (O&M) costs. The new facility will be designed to meet more stringent ammonia effluent limits based upon the EPA's latest national recommendation and implement nutrient controls to comply with the Kansas Nutrient Reduction Plan. The new facility also supports continued population shift to, and much needed, economic development, in the western service area resulting in a larger future customer base.

- Operational Improvements and Asset Management. Operational improvements to maximize flow through the WWTPs and continued refinement and enhancement of the Nine Minimum Controls (NMC) and Capacity, Management, Operation, and Maintenance (CMOM) Programs will reduce the potential for overflows. Continued development of an asset management program will allow the continued evaluation of assets and lead to prioritized renewal of assets based upon probability and consequence of failure rather than reactive repair leading to a more effective and sustainable utility. Increased system investigations and evaluations to determine condition of existing assets to optimize existing system performance, reduce system failures, and plan future improvements will also be performed.
- Kaw Point WWTP Reliability Improvements. Improvements to the UG's largest WWTP include several operational changes and equipment upgrades and repairs to improve facility reliability and increase wet weather treatment capacity. Several unit processes and equipment, which have experienced service outages, are scheduled for repair including primary clarifiers.
- Supervisory Control and Data Acquisition (SCADA) System Improvements. SCADA system improvements are expected to reduce overflows through monitoring and optimization of the existing system. Monitoring of pump stations and overflow locations allows the Water Pollution Control Division (WPCD) to respond to and reduce the amount of time overflows occur, gather additional information needed to refine technical assumptions and make smarter decisions on future improvements, and measure the overflow reduction achieved by future overflow control efforts. In the combined sewer system (CSS), this updated technology will allow the UG to better maximize flow to the Kaw Point WWTP. Although difficult to quantify in the short term, the resultant improvement in operations attainable through SCADA system improvements is anticipated to facilitate efforts to reduce overflows over the long run.
- Armourdale Basin Targeted Sewer Separation. Targeted sewer separation projects will not only relieve frequent street flooding and renew sewer infrastructure in the area, but also reduce overflow volume and frequency at CSOs 41, 42, 43, 44, 47, 48, and 66. Scheduled sewer separation is anticipated to reduce overflow volume to the Kansas River by 38% in the design year from these outfalls.
- CSO 19 Green Infrastructure. This CSS project will reduce CSO volume and frequency at CSO 19, provide some flood control benefit, and improve the water quality of Big Eleven Lake. An important civic resource, Big Eleven Lake is currently impaired due to increased nutrient loads. The proposed project will reduce nutrients and provide more baseflow to the lake, which will improve water quality. This project is proposed to be integrated into a planned urban redevelopment program that will be highly visible in the downtown district and is anticipated to stimulate urban renewal. Consisting of bioretention, bioswales, wetland forebays, and wetlands, implementing green infrastructure in this basin will provide a great opportunity to showcase different types of green infrastructure and evaluate its performance. It will also be used to estimate the cost of construction, operation, and maintenance for future green infrastructure efforts anticipated to be evaluated during future overflow control evaluations. Achieving this level of control utilizing green in lieu of

gray infrastructure will save the community approximately $7 million due to the reduction in size of downstream CSO control facilities. If the planned urban redevelopment plan changes, other green infrastructure projects that can provide equally significant overflow control have been identified and may be substituted for this project identified at CSO 19. We also see this project as an excellent opportunity to educate and engage the public regarding sewer overflow control issues and opportunities.

- Plant 20 Capacity Upgrades and Reliability Improvements. Improvements to Plant 20 include increasing the peak flow treatment capacity from 14 mgd to 21 mgd, thereby reducing the volume and frequency of discharges through the PS 6 overflow. Several renewal improvements, including influent screening replacement and new disinfection equipment and controls, are scheduled to increase safety, reliability, and extend the life of the aging facilities.

The Recommended Plan:

- Addresses the community's highest priorities of renewing the existing infrastructure and making progress towards meeting the CWA goals.
- Balances near term public investments and benefits with the UG's financial capability.
- Represents the best level of overflow control achievable with the available public investment.
- Incorporates input received from local stakeholder groups in 2015 and 2016, including a community task force consisting of local leaders selected by the Mayor and several UG Commissioners.
- Provides for the submission of a Final Measures Plan for agency approval by December 31, 2025.

1.3 Infrastructure Overview

The UG WPCD currently has 121 employees who build, maintain, and operate the wastewater and stormwater facilities for the people of Kansas City (KCK) and Wyandotte County (WyCo), Kansas. The WPCD provides sewer service to approximately 44,000 customers within WyCo, with a total population served of approximately 150,000. As shown on Figure 1-1, the entire sewer collection system area extends from the Missouri River and the Kansas and Missouri state line on the eastern border to the western edges of Wyandotte County. The northern boundary is primarily the Missouri River and the southern boundary is the Wyandotte and Johnson County line.

In the western portion of the county, the UG collection system borders the cities of Bonner Springs and Edwardsville, Kansas. A portion of Edwardsville is served by the UG's collection system; these flows are pumped into the UG system and treated at Plant 20.

The sewer collection system contains approximately 1,100 miles of combined and separate sanitary and storm sewer pipelines, five wastewater treatment plants, 71 wastewater pump stations, and nine flood pump stations. The five WWTPs have a combined design flow of over 35 mgd, ranging between 10,000 gallons per day (gpd) at WWTP 3 and 28 mgd at the Kaw Point WWTP. The UG also supports local drainage districts that maintain almost 20 miles of flood control levees along the Kansas and Missouri Rivers.

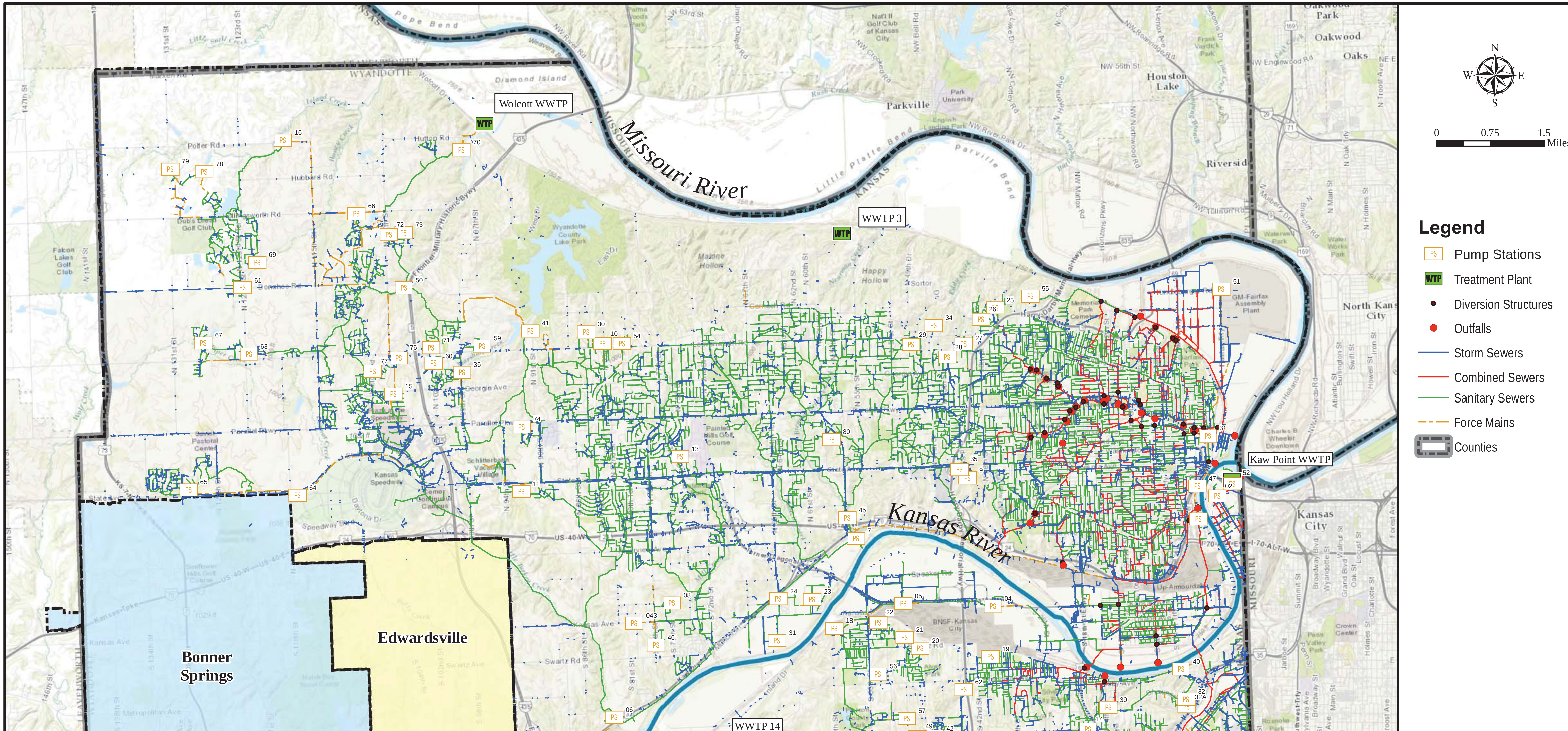


Figure 1-1: Collection System Service Area

Unified Government · Wyandotte County · Kansas City, Kansas

About 16% of the approximately 160 square mile UG service area is served by a CSS. The remaining 84% of the service area is served by a separate sewer system (SSS). The SSS serves the western portions of the service area while the CSS serves the eastern portions. During dry weather, wastewater from the CSS and SSS is conveyed to the WWTPs for treatment prior to discharge. The CSS is designed to overflow during periods of moderate to heavy rainfall or snowmelt. Combined wastewater and stormwater may leave the combined sewer system through any of the 48 diversion structures and 39 CSO outfalls resulting in sewage diluted with stormwater being discharged into the environment and potentially into one of four receiving waters. SSOs may also occur from the SSS during periods of heavy rainfall or snowmelt. Many of the SSOs occur at pump stations, but also at other locations when wet weather flows exceed the capacity of the sewer pipes.

1.4 History of Overflow Control Plan Development

CSSs were the accepted state of the art collection system when first installed. Hundreds of communities across the United States with CSSs have developed or are developing long-term control plans with the goal of reducing the frequency, duration, and volume of overflows. The UG developed and submitted an initial *Combined Sewer Overflow Long-Term Control Plan* (November 17, 2000) to the EPA in November 2000 to address combined sewer overflows into their rivers. Referred to as the *CSO LTCP*, development of the *CSO LTCP* was required by the 1994 *Combined Sewer Overflow Control Policy* (*CSO Control Policy*) through the UG's National Pollutant Discharge Elimination System (NPDES) Permit. After submittal, the UG began implementation of the LTCP while simultaneously implementing their NMC Plan. Struggling through significant financial and management challenges, the UG spent millions of dollars over the next 13 years on a number of sewer separation projects and WWTP and pump station capacity improvement projects identified in the *CSO LTCP*. Considerably more funds were spent to inspect, upgrade, and renew the sewer system infrastructure during this time period.

Despite this substantial financial commitment and CSO reduction progress, the *CSO LTCP* was not approved by the EPA (notice that the *CSO LTCP* was inadequate was not given to the UG until January 2007 after six years of implementing the plan). The UG subsequently entered into the PCD in March 2013 (copy provided as Appendix A).

A key requirement of the PCD is the development and submittal of an IOCP to remedy CSOs and SSOs as well as the implementation of other injunctive relief. Because this PCD covers only the development of the remedy, the parties to the PCD recognized that there may be a future consent decree, modification, or other vehicle (such as an NPDES permit requirement and/or State order/decree) that will implement the approved IOCP.

1.5 Partial Consent Decree Requirements

As specified by the EPA, the stated purpose of the PCD is to fulfill the objectives of the CWA and achieve full compliance with the CWA by achieving full compliance with the NPDES permits, reducing SSOs and CSOs, eliminating prohibited bypasses, and implementation of the stormwater management program to reduce the discharge of pollutants from the MS4 to the maximum extent practicable. Under the terms of the settlement, the UG was required to implement a number of remedial measures, including:

- Information Management System (IMS) – Develop a system to efficiently and effectively identify, track, operate, maintain, manage and plan for UG's wastewater and stormwater programs.
- Storm Sewer System – Implement a newly revised Stormwater Management Plan (SMP).

- Combined and Separate Sewer Systems – Construct short-term investigation and construction projects valued at approximately $20 million, including SSS pump station rehabilitation evaluation and repair, and stream crossing inspections to locate exposed pipelines at risk due to stream bank erosion.
- Operations:
    - Improve the Fats, Oil, and Grease (FOG) Control Program Plan.
    - Improve the Collection System Release Response Plan (CSRRP).
    - Improve the NMC Plan for the CSS.
    - Submit a comprehensive CMOM Program Plan.
- Evaluation of Sewersheds – Prepare and submit a sewer system evaluation work plan, describing how the UG will evaluate, analyze, model, develop alternatives, and include public participation for the evaluation of the SSS and CSS.
- Hydraulic Models – Develop a dynamic hydraulic model of the SSS and CSS to help assess the capacity of the SSS and evaluate CSO control scenarios for the CSS. Using the hydraulic model, develop and evaluate remedial alternatives, including green infrastructure, to ensure adequate capacity in the CSS, SSS, and the WWTPs.

Subsequent to the PCD, a *Sewer System Evaluation* (*SSE) Work Plan* was developed and submitted to the EPA as required outlining the technical details of the sewer characterization process. Numerous technical memoranda (TM) were prepared to support the characterization effort in accordance with the *SSE Work Plan*.

The *CSS Characterization Report* is an integral part of the IOCP and a requirement of Section VIII, Subsections D and E of the PCD. This system characterization documents the physical characteristics and capacity of the CSS. In addition, the impact of the CSS on the receiving waters is provided. The receiving water impact is based on existing data and current monitoring and modeling of the CSS and receiving waters. The system characterization establishes the existing baseline conditions and provides the basis for determining receiving water goals and priorities and identifying specific CSO controls for further consideration in this IOCP. The *CSS Characterization Report* was submitted to the EPA on May 31, 2015. An addendum to this characterization report is included with this IOCP submittal.

The *SSS Characterization Report* is also an integral part of the IOCP and a requirement of Section VIII, Subsections B and C of the PCD. This system characterization documents the physical characteristics and capacity of the SSS. The system characterization establishes the existing baseline conditions and provides the basis for determining priorities and identifying specific capacity improvements for further consideration in this IOCP. The *SSS Characterization Report* was submitted to the EPA on August 31, 2015. An addendum to this characterization report is included with this IOCP submittal.

This IOCP, prepared in accordance with the requirements of the PCD, presents the UG's comprehensive, integrated plan to continue the UG's efforts to reduce and mitigate the effects of wet weather CSOs and to minimize SSOs and other unauthorized discharges. As a result of financial challenges presented herein, the UG is proposing a plan that focuses resources on infrastructure renewal and key capital improvement projects. Debt financing will be a key part of the revenue to fund this commitment for projects such as the new, larger capacity Wolcott WWTP. State and federal financial assistance will be pursued for the Recommended Plan and the later Final Measures Plan. Through these system reliability improvements, additional overflow reduction will be achieved while maintaining sustainable, yet aggressive, annual rate increases.

1.6 Report Organization and Contents

This IOCP consists of the following sections:

- Section 1 – Introduction. Provides background of the UG's CSS and SSS and overflow control regulatory history.
- Section 2 – System Characterization. Documents the physical characteristics and capacity of the CSS and SSS. In addition, the impact of the CSS on the receiving waters is provided.
- Section 3 – Infrastructure Condition Assessment. Documents the sewer system infrastructure condition assessment and necessary capital improvement needs.
- Section 4 – Regulatory Needs Assessment. Summarizes water quality regulatory drivers that may affect future NPDES permits and potential capital improvement needs.
- Section 5 – CSO Long-Term Control Plan. Evaluates capital improvements necessary to achieve various levels of CSO control.
- Section 6 – SSO Remediation Plan. Evaluates capital improvements necessary to achieve various levels of SSO service.
- Section 7 – Financial Capability. Summarizes the assumptions, analysis, and findings associated with assessing the UG's financial capability to fund the necessary improvements to comply with the CWA and *CSO Control Policy*.
- Section 8 – Public Participation. Details the public participation efforts performed during development of the IOCP.
- Section 9 – IOCP Recommended Plan. Details the recommended plan proposed in response to the PCD.
- Section 10 – References. Provides references to the documents referenced in the IOCP.

2.0 SYSTEM CHARACTERIZATION

2.1 Combined Sewer System

A system characterization documents a detailed understanding of the CSS and its impact on the receiving waters as described in the *CSO Control Policy*. An analysis of existing data and field investigation results and monitoring and modeling of the CSS and receiving waters was performed to understand how the system responds to various wet weather events, characteristics of the overflows, and the resultant water quality impacts. The system characterization established the baseline conditions that were used to evaluate level of control alternatives and assess the effectiveness of the proposed IOCP.

To characterize the existing system, the UG reviewed existing data, performed field investigations and flow and rainfall monitoring, performed hydraulic modeling and analysis, and developed preliminary CSO control alternatives. To document this effort, the UG submitted the *CSS Characterization Report* to the Kansas Department of Health and Environment (KDHE) and the EPA on May 31, 2015. Refinements to hydraulic modeling and alternative development have continued beyond submittal of the *CSS Characterization Report*; these refinements are discussed in detail in the *CSS Characterization Report – Addendum No. 1*. A brief description of the CSS, a summary of key findings of the characterization process, and updated information from additional refinement efforts are summarized in this Section.

2.1.1 CSS Basins

The CSS portion of the UG's service area is generally located east of Interstate 635 and extends south from the Missouri River to Johnson County, Kansas, and east to the Missouri state line as shown previously on Figure 1-1. The CSS basins discharge to the Kaw Point WWTP located immediately east of the confluence of the Kansas and Missouri Rivers.

The CSS can be sub-divided into nine subbasins and three main service areas based on the areas tributary to the three primary pump stations in the CSS as shown on Figure 2-1 and Figure 2-2, respectively:

- Armourdale Industrial District (AID) Pump Station services the southern CSS areas west of the Kansas River, including the Mattoon Creek, Splitlog Creek, Muncie Bluff Creek, Armourdale, and Argentine Basins.
- Fairfax Industrial District (FID) Pump Station services the northern CSS areas west of the Kansas and Missouri Rivers, including the Esplanade Creek, FID, and Jersey Creek Basins.
- Central Industrial District (CID) Pump Station services a relatively small area east of the Kansas River to the Missouri state line, comprising the CID Basin.

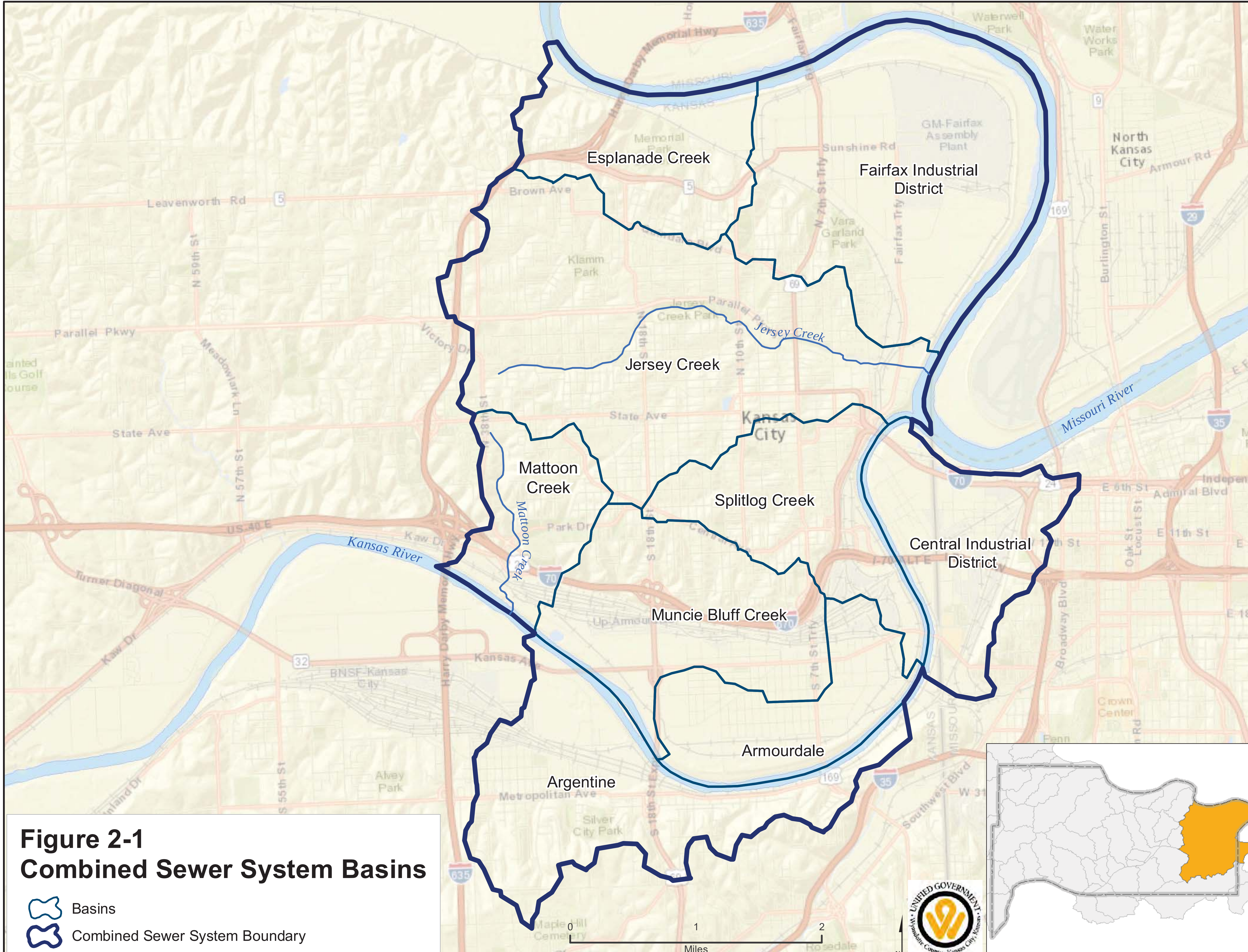
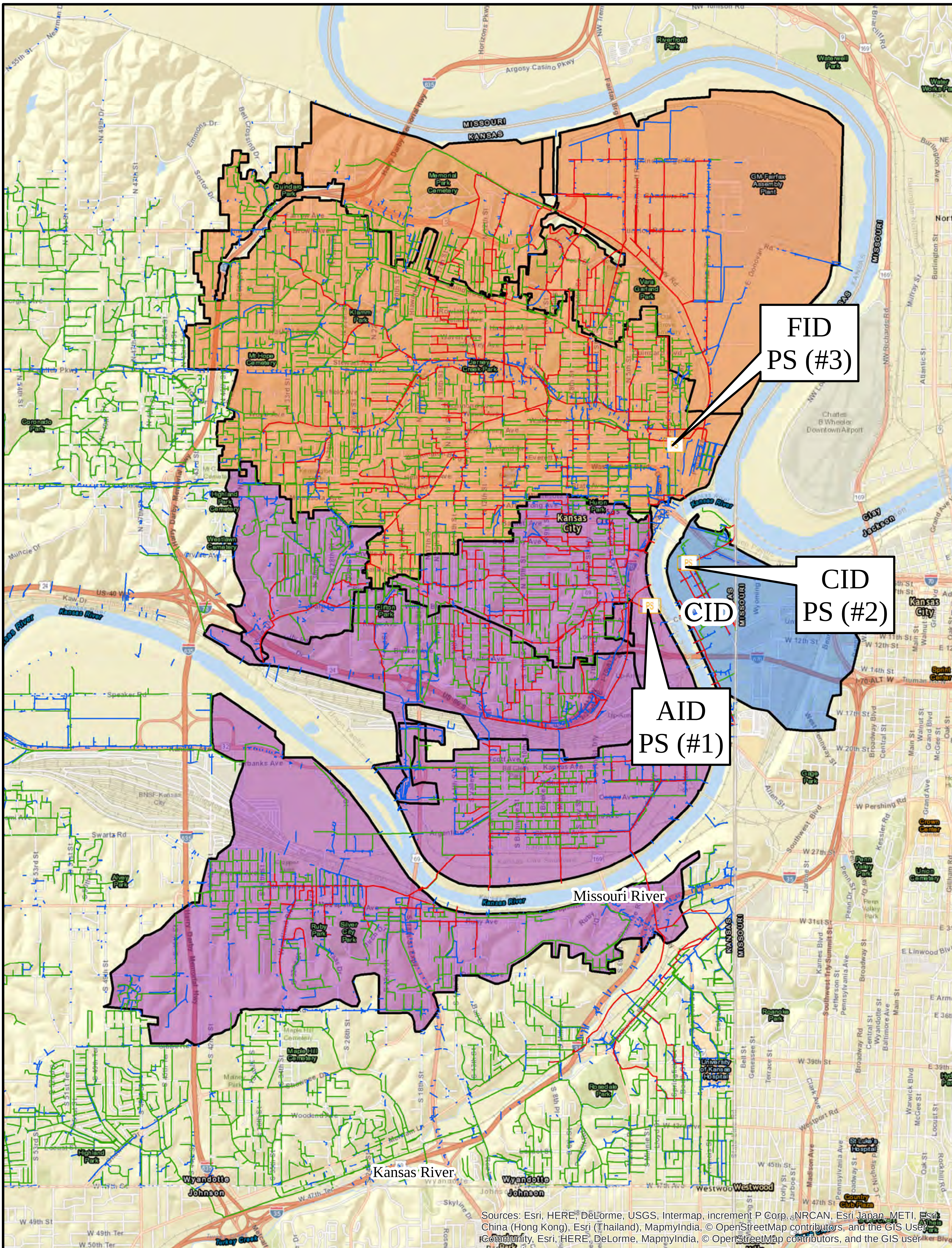


Figure 2-1
Combined Sewer System Basins



Legend

- PS Primary Pump Stations
- AID PS Service Area
- CID PS Service Area
- FID PS Service Area
- Combined Sewers
- Sanitary Sewers
- Storm Sewers

N

0 1 2 Miles

Unified Government Wyandotte County • Kansas City, Kansas

Figure 2-2

Primary CSS Pump Station Service Areas

In addition to the combined sewer basins, there are a number of basins with separate sewer systems that are tributary to the CSS. These basins are generally west and south of the CSS area and separate sanitary flow is pumped into the CSS as discussed in the SSS Basins section.

During wet weather, when the combined sewage flows exceed the capacity of the sewer system, overflows to four receiving streams may occur. A flow schematic of the CSS is provided on Figure 2-3. As indicated on this figure:

- Overflows from the Jersey Creek Basin discharge to both Jersey Creek and the Kansas River.
- Overflows from the Esplanade Creek and FID Basins discharge to both Jersey Creek and the Missouri River.
- Overflows from the CID Basin discharge to the Missouri River.
- Overflows from the Mattoon Creek Basin discharge to Mattoon Creek.
- Overflows from the Argentine, Armourdale, Muncie Bluff Creek, and Splitlog Creek Basins discharge to the Kansas River.

Each of the CSS basins tributary to the individual primary pump stations is hydraulically interconnected to the others. Consequently, CSO diversion structures in the upstream basins contribute captured flow to diversion structures downstream along the interceptor sewers. The percent capture at individual diversion structures is dependent on relative weir heights and localized pipe capacities; therefore, percent capture values calculated at individual diversion structures may be misleading to that of the overall basin. For this reason, the CSS basins were grouped together by the primary pump stations to which they are tributary, and CSO capture statistics were calculated based on the three primary pump station service areas described above. This capture calculation methodology provides a more true representation of the capture efficiency of the existing system by summing the overflow volumes at all the interconnected diversion structures in each pump station service area and comparing that to the total volume of combined flow captured at each primary pump station.

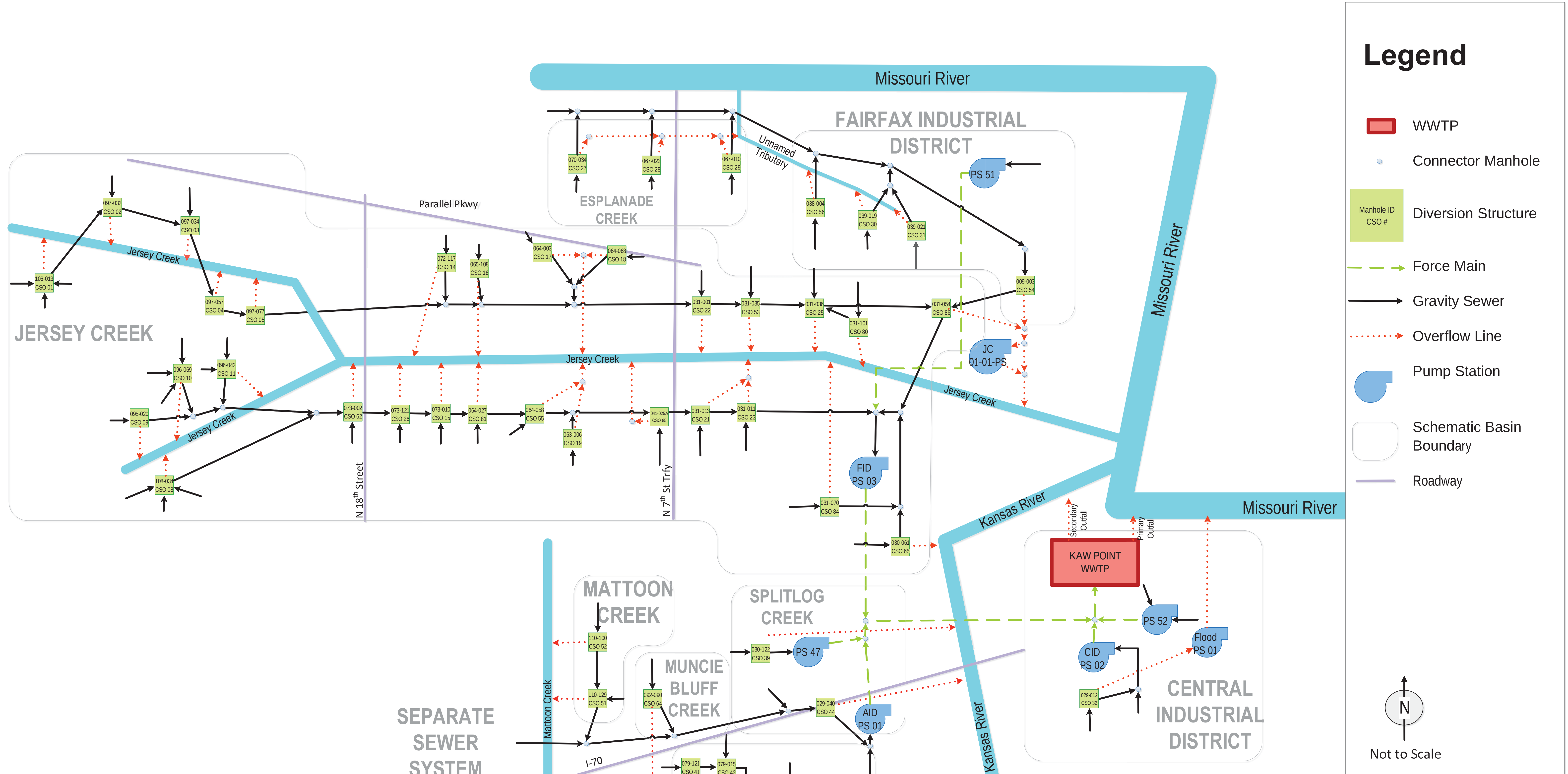


Figure 2-3:
Combined Sewer System
Flow Schematic

The terrain within the CSS generally consists of rolling hills in upland areas away from the main river system. Upland areas contain mainly residential development with interspersed commercial, and some light industrial areas as well as the KCK downtown area.

Areas along the Kansas and Missouri Rivers consist of low, former floodplain areas and are currently protected by levees. The northern part of the CSS along the Missouri River in the Esplanade Creek and Fairfax Industrial District Basins (tributary to FID Pump Station) contains light and heavy industrial development. In the southern portion of the CSS along the Kansas River, the Armourdale and Argentine Basins (tributary to AID Pump Station) have predominantly industrial and commercial development with interspersed residential development. This area also contains a significant amount of land occupied by railyards.

The current sewer system conditions tend to yield lower stormwater runoff volumes and runoff rates reaching the CSS due to a number of factors. These factors also result in a higher than typical percent capture relative to overflow frequency. Some unique features of the UG CSS include:

- Subsequent to the 2000 *CSO LTCP*, sewer separation has been performed in parts of the upper Jersey Creek, Mattoon Creek, western Muncie Bluff Creek, western and eastern Armourdale, and Argentine Basins. The majority of the upstream CID Basin is also separated. This sewer separation reduces the amount of land area contributing stormwater flow directly to the CSS and reduces CSO volumes, thereby increasing the overall percentage of CSS wet weather flows delivered to the WWTP.
- Over 6,000 vacant lots in the CSS lower the amount of directly connected impervious area contributing to the CSS. Much of the impervious area is disconnected and has to flow over pervious areas before reaching a stormwater inlet.
- The majority of streets within residential areas have no curbs and a limited amount of stormwater inlets, most of which are grated inlets. This helps limit peak flow rates to the CSS and creates inefficiencies in directing surface runoff into the collection system piping.
- The large railroad yards in the Armourdale and Argentine Basins have small amounts of impervious area, very few inlets, and flat terrain leading to shallow ponding of stormwater runoff and longer times of concentration.
- The rainfall events in the hydraulic model design year include high peak intensities embedded in the event. These peak intensities are of short duration relative to the total length of the rainfall event. Based on the calibrated model results, the UG CSS tends to capture the portions of the event with lesser rainfall intensities and overflows predominantly during the peak intensities. Since the duration of overflow events are short compared to the duration of rainfall events, overflow volume is small compared to wet weather capture volume. This tends to yield high percent captures in the UG CSS relative to the high overflow frequency in certain locations.

2.1.2 Gravity Sewer System

Comprised of almost 300 miles of 4- to 102-inch diameter pipe, the CSS gravity sewer system inventory is provided in Table 2-1. There is also almost 50 miles of CSS and SSS wastewater force main in the service area.

Table 2-1: CSS Gravity Sewer Inventory

Basin	Area (ac)	Sewer Length (ft)
Argentine	1,897	151,289
Armourdale	1,050	94,732
Mattoon Creek	834	75,559
Muncie Bluff Creek	1,655	174,363
Splitlog Creek	1,262	176,612
Esplanade Creek and FID	1,211	219,994
Jersey Creek	3,646	625,877
CID	1,227	29,073
Totals	12,782	1,547,499

Source: UG GIS data (September 1, 2016).

2.1.3 CSO Outfalls and Diversion Structures

There are currently 39 CSO outfalls and 48 diversion structures in the CSS. Each diversion structure, associated basin, and receiving water are listed in Table 2-2. The diversion structures and outfalls are shown schematically on Figure 2-3. Twenty-nine CSO diversion structures discharge to Jersey Creek, which ultimately discharges to the Kansas River. Nine CSO diversion structures discharge directly to the Kansas River; eight CSO diversions discharge directly to the Missouri River. Two CSO diversions discharge to Mattoon Creek, which ultimately discharges to the Kansas River.

Table 2-2: CSO Outfall and Diversion Structure Inventory

CSO Diversion ID	Diversion Structure Location	Basin	Receiving Water	Outfall Coordinates		Outfall Structure No.
				Longitude	Latitude	
1	28th Street and Georgia Avenue	Jersey Creek	Jersey Creek	-94.660616314	39.135612814	106-175
2	Klamm Park	Jersey Creek	Jersey Creek	-94.659026875	39.135264906	097-019
3	Klamm Park	Jersey Creek	Jersey Creek	-94.656561007	39.133541004	097-025
4	2319 North 21st Street	Jersey Creek	Jersey Creek	-94.653612424	39.132588325	097-029
5	2118 Waverly Avenue	Jersey Creek	Jersey Creek	-94.653523661	39.131920684	097-031
8	29th Street and Freeman Avenue	Jersey Creek	Jersey Creek	-94.661222742	39.122029350	108-179
9	25th Street and New Jersey Avenue	Jersey Creek	Jersey Creek	-94.657549968	39.122069474	095-174
10	1852 Glendale Avenue	Jersey Creek	Jersey Creek	-94.651588162	39.124787308	096-015
11	1932 Glendale Avenue	Jersey Creek	Jersey Creek	-94.650379785	39.126812958	096-093
14	Parallel Parkway west of 12th Street	Jersey Creek	Jersey Creek	-94.641199417	39.129084823	072-115

CSO Diversion ID	Diversion Structure Location	Basin	Receiving Water	Outfall Coordinates		Outfall Structure No.
				Longitude	Latitude	
15	North Valley Street, south of Jersey	Jersey Creek	Jersey Creek	-94.642007381	39.128695346	072-118
16	11th Street and Lafayette Avenue	Jersey Creek	Jersey Creek	-94.638054308	39.127960639	064-050
17	Across from 2012 Darby Avenue	Jersey Creek	Jersey Creek	-94.632396468	39.125857250	064-019
18	2003 North 9th Street (in driveway)	Jersey Creek	Jersey Creek	-94.632396468	39.125857250	064-019
19	9th Street and Walker Avenue	Jersey Creek	Jersey Creek	-94.632287595	39.125764114	064-017
21	5th Street and Freeman Avenue	Jersey Creek	Jersey Creek	-94.618708899	39.121996813	031-033
22	5th Street and Walker Avenue	Jersey Creek	Jersey Creek	-94.621341991	39.123026401	032-101
23	4th Street and Freeman Avenue	Jersey Creek	Jersey Creek	-94.618708899	39.121996813	031-033
25	3rd Street and New Jersey Avenue	Jersey Creek	Jersey Creek	-94.616156155	39.121454527	031-133
26	Northeast of 18th Street and Troup Avenue	Jersey Creek	Jersey Creek	-94.646901234	39.128910870	072-113
27	Esplanade Street and 12th Street	Esplanade Creek	Missouri River	-94.631600439	39.145478587	067-055
28	Parkwood Boulevard and Esplanade Street	Esplanade Creek	Missouri River	-94.631600439	39.145478587	067-055
29	10th Street and Esplanade Street	Esplanade Creek	Missouri River	-94.631600439	39.145478587	067-055
30	7th Street and Manorcrest Drive	FID	Missouri River	-94.623246837	39.140856912	039-104
31	7th Street and Manorcrest Drive	FID	Missouri River	-94.622548707	39.140502160	039-016
32	Ohio Avenue and James Street	CID	Missouri River	-94.607205085	39.112336305	011-064
39	Strawberry Hill Pump Station	Splitlog Creek	Kansas River	-94.618035436	39.110706121	030-021
41	14th Street and Kansas Avenue	Armourdale	Kansas River	-94.640126365	39.074823573	080-060
42	12th Street and Kansas Avenue	Armourdale	Kansas River	-94.640126365	39.074823573	080-060
43	Mill Street and Cheyenne Avenue	Armourdale	Kansas River	-94.630425654	39.075456673	048-015

CSO Diversion ID	Diversion Structure Location	Basin	Receiving Water	Outfall Coordinates		Outfall Structure No.
				Longitude	Latitude	
44	Northeast of Interstate 70 and Central Avenue	Splitlog Creek	Kansas River	-94.618514020	39.106341941	029-005
47	South 14th Street, North of Ruby Avenue	Argentine	Kansas River	-94.644277173	39.073039881	080-001
48	Strong Avenue Flood PS	Argentine	Kansas River	-94.648937160	39.075033982	080-002
51	Grandview Boulevard and Park Drive	Mattoon Creek	Mattoon Creek	-94.662255622	39.104548981	110-060
52	Grandview Boulevard and Riverview	Mattoon Creek	Mattoon Creek	-94.660916076	39.106372761	110-136
53	4th Street North of Jersey Creek	Jersey Creek	Jersey Creek	-94.618848665	39.122121657	031-149
54	North of Fairfax Drainage District PS	FID	Missouri River	-94.611703401	39.121454642	010-575
55	10th Street and Walker Avenue	Jersey Creek	Jersey Creek	-94.632287595	39.125764114	064-017
56	North of Viewcrest Drive	FID	Missouri River	-94.627784478	39.143184106	038-006
62	18th Street and Troup Avenue	Jersey Creek	Jersey Creek	-94.649131572	39.127737634	096-003
64	Interstate 70 at 22nd Street	Muncie Bluff Creek	Kansas River	-94.653977310	39.095379443	092-002
65	2nd Street and Minnesota Avenue	Jersey Creek	Jersey Creek	-94.613804020	39.115270658	030-015
66	Mill Street and Pawnee Avenue	Armourdale	Kansas River	-94.630425654	39.075456673	048-015
80	3rd Street and New Jersey Avenue	Jersey Creek	Jersey Creek	-94.616156155	39.121454527	031-133
81	10th Street and Troup Avenue	Jersey Creek	Jersey Creek	-94.636693117	39.127352933	064-049
84	3rd Street and Walker	Jersey Creek	Jersey Creek	-94.616262716	39.121375610	031-106
85	8th Street and Walker	Jersey Creek	Jersey Creek	-94.628845254	39.124730528	041-583
86	1620 Fairfax	Jersey Creek	Jersey Creek	-94.611703401	39.121454642	010-575

Note: Non-consecutive CSO Diversion ID numbers reflect the fact that the UG has eliminated CSO diversions, where possible, over the years.

2.1.4 Pump Stations and Force Mains

The UG owns and operates six pump stations in the CSS as indicated in Table 2-3 and shown on Figure 1-1.

Table 2-3: CSS Pump Station and Force Main Inventory

Pump Station ID	Basin	WWTP Basin	Address	Pump Rated Capacity[1] (gpm)	Tested Capacity (mgd or gpm)	Force Main Diameter (in)	Force Main Length (ft)	Force Main Pipe Material
AID (#1)	Splitlog Creek	Kaw Point WWTP	300 North 4th Street	5@9,500	37.5 mgd[2] (4 pumps operating)	48	5,800	RCP/DIP
CID (#2)	CID	Kaw Point WWTP	300 North James Street	3@4,100	11.5 mgd[3] (2 pumps operating)	24	1,475	CIP
FID (#3)	FID	Kaw Point WWTP	1520 North 2nd Street	5@6,100	31.7 mgd[3] (3 pumps operating)	36	4,865	CIP
47	Splitlog Creek	Kaw Point WWTP	403 Orville Avenue	2@250	250 gpm[4]	8	172	DIP
51 (General Motors)	FID	Kaw Point WWTP	3285 Fairfax Trafficway	3@1,900	3.2 mgd[3] (2 pumps operating)	18	11,825	DIP
52	CID	Kaw Point WWTP	17 Ohio Street	2@400	400 gpm[4]	4	80	CIP

Notes:
1. Pump nameplate capacity.
2. Field testing as documented in *Summary Report for Field Reconnaissance*, Black & Veatch, December 2013.
3. Field testing as documented in *Summary Report for Field Reconnaissance for the Jersey Creek Basin*, Burns & McDonnell, March 2014.
4. Firm capacity based on nameplate capacity with largest pump out of service; pumps not field tested.

The total design capacity of the three primary CSS pump stations is 95 mgd, which is higher than the hydraulic capacity of the Kaw Point WWTP. Also, the FID and AID Pump Stations share a common force main under the Kansas River. This limits their combined pump station capacity to less than the tested capacity, since the station not being tested was shut down. Due to these constraints, the pump stations are not operated to their full design or tested capacity. During wet weather events, priority is given to the CID and AID Pump Stations while the FID Pump Station is throttled back to limit flow to the WWTP. The CSS pump station operation procedure is referenced in the UG's *Standard Operating Procedure for Flow Control at KCK WWTP No. 1 (Kaw Point)*. This wet-weather operation procedure results in a higher percentage of overflow being discharged to the Missouri River as compared to the Kansas River. This is done due to the smaller stream flows that occur in the Kansas River relative to the Missouri River.

2.1.5 Kaw Point Wastewater Treatment Plant

The Kaw Point WWTP lies at the confluence of the Kansas and Missouri Rivers in the east portion of the UG system. It is located north of Interstate 70, south of the Missouri River and adjacent to the state line. The legal description is NW ¼, Section 11, Township 11 South, Range 25 East. The WWTP is located within the CID Basin, serves the entire CSS as well as portions of the SSS that flow into the CSS, and treats combined sewer flow from the AID, CID, and FID Pump Stations. The Kaw Point WWTP discharges primarily to the Missouri River with a secondary discharge to the Kansas River during some wet weather events. Select plant operations and effluent limits are regulated by the KDHE through the facility's NPDES Permit.

As shown on the site layout on Figure 2-4 and the flow schematic on Figure 2-5, the Kaw Point WWTP consists of primary and secondary treatment and disinfection facilities. Primary treatment consists of screening, grit removal, and primary sedimentation; secondary treatment consists of high purity oxygenation and final clarification. A recently constructed ultraviolet (UV) disinfection facility downstream of the final clarifiers provides disinfection prior to discharge.

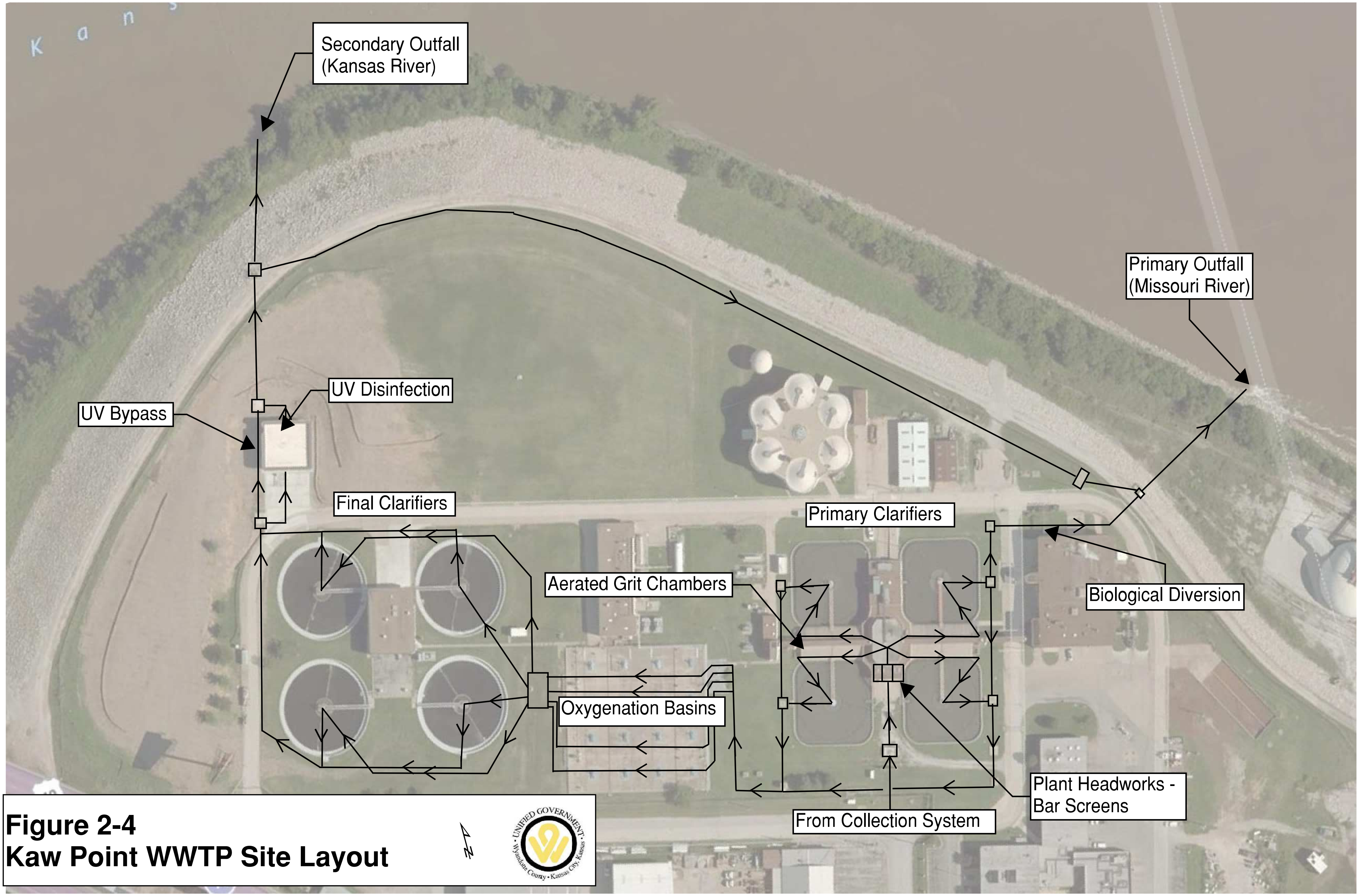
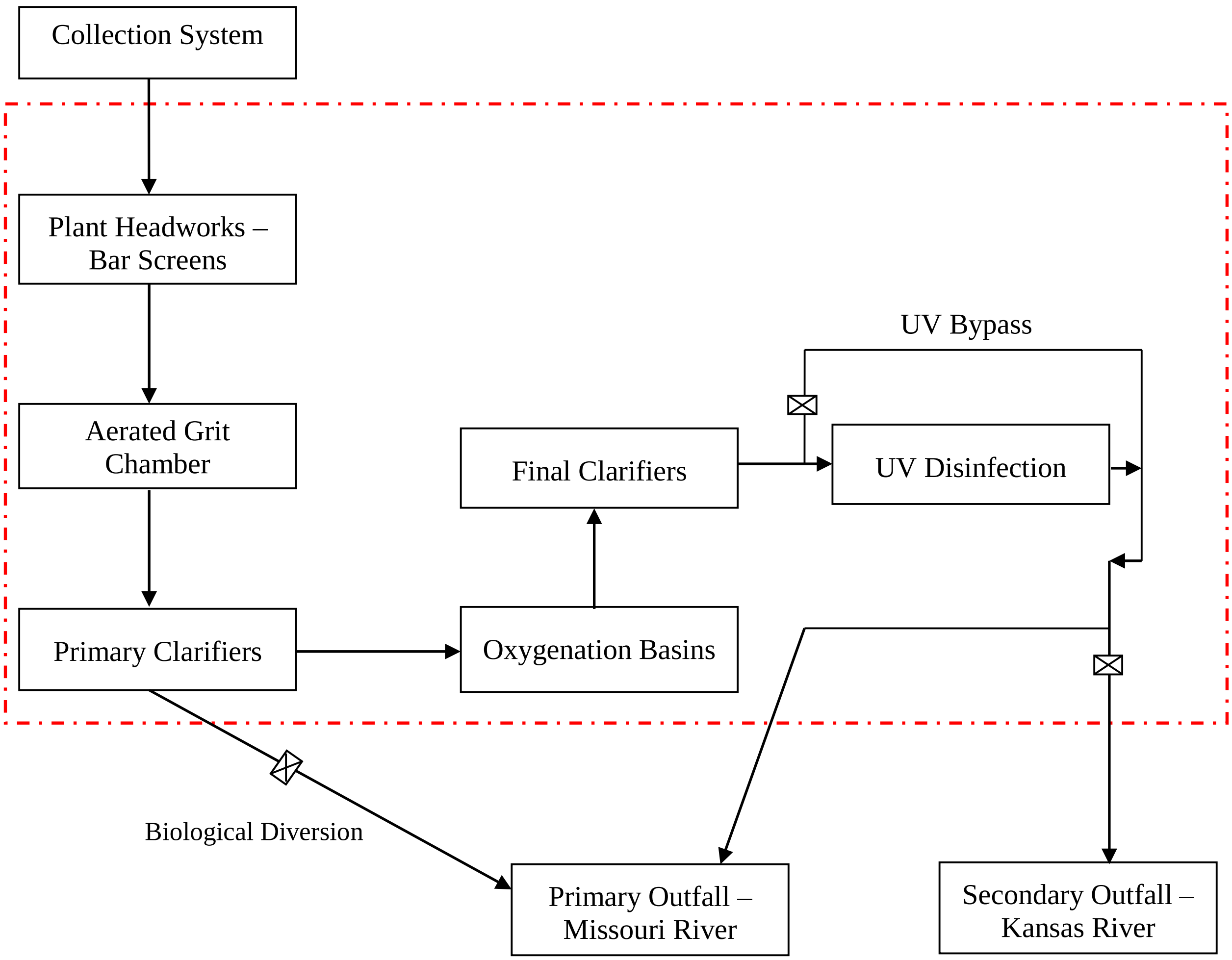


Figure 2-4
Kaw Point WWTP Site Layout

Figure 2-5: Kaw Point WWTP Flow Schematic



The primary treatment process has a permitted capacity of 56 mgd and the secondary treatment process has a permitted capacity of 48 mgd. However, as discussed in the next sub-sections, the WWTP does not have the hydraulic or treatment capacity to be operated at the permitted capacities.

When WWTP flow exceeds the secondary treatment capacity, a gate can be opened to direct flow to the Missouri River after primary treatment as indicated by the Biological Diversion on the flow schematic. The gate used for the Biological Diversion is an upward opening sluice gate at the bottom of a flooded junction structure with no ability to measure or control the flow being diverted. Improvements to this structure would be required to accurately divert flow while maintaining a constant flow to secondary treatment.

The Kaw Point WWTP also has the capability to route post-secondary treatment flow to either the Missouri River (Primary Outfall) or Kansas River (Secondary Outfall). The flow split between the two outfalls is adjusted as required to maintain the appropriate water surface elevation in the UV disinfection channels; discharge through the Primary Outfall is given priority. When the water level in the UV effluent channel reaches a set point, a portion of the flow is directed to the Secondary Outfall to allow the UV level control gates to maintain the proper water elevation in the UV channels and prevent damage to the UV equipment. This typically occurs when flow through secondary treatment exceeds 30 mgd, but is also dependent on river elevations.

2.1.5.1 Hydraulic Capacity Analysis

An evaluation of the hydraulic loading rates of specific treatment operations and the hydraulic plant capacity was performed at the Kaw Point WWTP to identify constrictions and potential opportunities to increase treatment capacity of the WWTP during wet weather events. The hydraulic capacities discussed below assume all treatment equipment is fully operational; the current condition of some of the treatment equipment often precludes this situation from occurring consistently.

As previously noted, total permitted wet weather flow through secondary treatment is 48 mgd while primary treatment is a maximum of 56 mgd (with 8 mgd biological diversion). Based on an evaluation of plant hydraulics and observations at flows at or above 42 mgd, the weirs at the final clarifiers become submerged and an increase in suspended solids has been observed to overflow the weirs. To allow for a consistent flow of 48 mgd through the secondary, hydraulic improvements between the final clarifiers and UV facility or modifications to the final clarifier weirs will be needed to prevent short-circuiting. In addition, if more flow passed through primary treatment, the upward-opening sluice gate (with no ability to control flow) used for the biological diversion would require modification to be effective.

The primary clarifiers and grit chambers are not hydraulically limited by standard overflow rates at the permitted flow of 56 mgd; however, the ability to pass flow through the influent screens and aerated grit chambers is limited hydraulically to approximately 48 mgd. Modifications to reduce turbulence and increase the wall height at the screens can be made to achieve slightly higher flow rates. In addition, the gravity pipe conveying flow from the AID and FID Pump Stations is prone to grit accumulation during dry weather further limiting the hydraulic conveyance capacity into the Kaw Point WWTP. This gravity pipe was designed to be submerged and presents difficult maintenance for cleaning and maintaining design flows through this pipe. This hydraulic bottleneck is preventing maximum flow from the collection system from reaching the Kaw Point WWTP.

2.1.5.2 Treatment Capacity Stress Test

To determine the maximum flow through the Kaw Point WWTP that can be effectively treated biologically without upsetting the existing processes, the following stress testing and evaluations were performed:

- Field-testing and state point analysis of Final Clarifier No. 3 in accordance with industry standards (Water Environment Research Foundation, 2001).
- Stress testing of Final Clarifier No. 3 during wet weather flow conditions.
- Dynamic process modeling of the treatment facilities with GPS X simulation software.

Field testing was performed on October 26 and November 6, 2015, to generate a mixed liquor solids flux curve for Final Clarifier No. 3. This clarifier was selected for testing because it has the most consistent treatment capability and was considered most representative of what the clarifiers can treat in proper working condition. The data collected was then used in clarifier state point analyses, which indicated a peak wet weather influent capacity of 12 to 13 mgd for Train No. 3 of the high purity oxygen activated sludge (HPO-AS) system contingent upon the following key characteristics and operating parameters:

- Mixed Liquor Suspended Solids (MLSS) ≤ 3,650 mg/L.
- Sludge Volume Index (SVI) ≤ 72 mL/g. Furthermore, subsequent stress testing from December 13 through 15, 2015, found higher than normal effluent total suspended solids (TSS) when the SVI dropped below approximately 45 mL/g.

Stress testing conducted during four different trial events from November through December 2015 demonstrated that Train No. 3 could successfully maintain the aforementioned flow rates for approximately two days before sludge blanket washout could potentially become a problem.

For dynamic process modeling, a one-year influent hydrograph for the Kaw Point WWTP from the CSS model using the Design Year rainfalls assumed that the Kaw Point WWTP had a hydraulic capacity of 56 mgd and enough storage in the CSS to reduce overflows to 12 or less per Design Year. From this Design Year hydrograph, the 30-day period with the greatest average flow rate to the Kaw Point WWTP was selected for dynamic process modeling which predicted that the existing HPO-AS facilities would have the process capacity to successfully treat wet weather flows up to 48 mgd.

However, during several wet weather events since 2014, plant staff observed effluent weir submergence and short-circuiting of the final clarifiers at influent flow rates in the range of 42 to 47 mgd with all four trains in service, which is less than the 48 to 52 mgd suggested by the stress testing of Train No. 3 alone. Based on the hydraulic and process evaluations discussed, the Kaw Point WWTP is limited to wet weather treatment of 42 mgd due to the effluent weir submergence at the final clarifiers. As previously noted, additional hydraulic limitations exist in the influent screening channels and the influent gravity pipe. Modifications to improve or eliminate hydraulic bottlenecks could allow the Kaw Point WWTP to treat 48 to 52 mgd as evidenced by the stress test and the process model.

2.1.6 CSS Hydraulic Modeling

The principal tool used in assessing the capacity of the CSS was a dynamic hydraulic system model that was developed, calibrated and verified on the basis of sewer system flow and rainfall data obtained from a monitoring system specifically established and operated for that purpose. Innovyze's InfoWorks CS was used to develop the system hydraulic model for the CSS. Innovyze subsequently converted the model to InfoWorks ICM upon the discontinuation of support for the CS version.

The sewer system model utilizes base flow, precipitation, subcatchment information, and conveyance system information with hydrologic and hydraulic calculating procedures to simulate sewer system flow characteristics. This tool supports the engineering analysis necessary to perform the following tasks:

- Characterize the CSS response to wet weather events
- Estimate the volume and frequency of combined sewer overflows at each outfall in the system based on existing conditions
- Evaluate alternatives to reduce overflow volume and frequency
- Model performance of the CSS with selected overflow controls in operation and provide full-year hydrographs of CSOs at each outfall in the system for use in determining the effect of selected controls on receiving water quality

2.1.6.1 Design Storm and Design Year Development

An evaluation of precipitation data was completed to define typical rainfall distribution patterns and recurrence intervals. Historical precipitation data was utilized to develop design storms and the Design Year that was applied when modeling the existing conditions and alternative control scenarios. The Design Year was developed to represent conditions expected in a typical or "average" year. Precipitation data for 2001 was evaluated to assess event distribution on an annual and seasonal basis. Design storms were utilized to mimic the event distribution on an annual and seasonal basis resulting in the full Design Year hyetograph. Detailed discussion of the statistical analysis performed to develop the design storms and

Design Year and Design Year hyetograph are found in Appendix A of the *SSE Work Plan* and in the *CSS Characterization Report*.

2.1.6.2 Hydraulic Model Configuration

The CSS model is a complex combination of separate sanitary and storm sewer systems as well as combined sewer systems. In general, the model includes pipes 15 inches in diameter and larger, pipes within 1,000 feet of outfalls, and other pipes required for connectivity purposes that may be smaller than 15-inch diameter. The combined system included in the hydraulic model ranges from 8-inch diameter pipe to 11-feet by 12-feet reinforced concrete box (RCB). The combined sewer system model includes areas served by separated sanitary and separated storm drainage systems. The storm drainage systems that have been included in the model interconnect with the downstream combined sewer system affecting wet weather flows to the interceptor system. The hydraulic model contains 131 control structures and 21 pump stations. The pump stations configured into the model include both SSS and CSS pump stations. A detailed listing of the hydraulic control structures is contained in the *CSS Characterization Report*.

A number of tasks were performed to develop the CSS hydraulic model. Field data collection was performed to increase the accuracy of the geographic information system (GIS) database and the sewer system model network. Several flow monitoring and rainfall monitoring efforts provided data to perform calibration and verification of the hydraulic model. Detailed documentation of the field data collection, flow and rainfall monitoring, and model calibration and verification efforts are included in the *CSS Characterization Report*.

Calibration of the model was performed in 2013 based on flow and rainfall monitoring performed in the spring of 2013 and historical flow and rainfall monitoring data performed in prior years. A subsequent calibration was performed in 2015 based on additional flow monitoring in various areas of the CSS to further verify system response and improve model accuracy.

2.1.6.3 Dry Weather Calibration and Verification

The model was calibrated to both a weekday and weekend dry weather hydrograph created from the hourly aggregated dry weather flow data for each flow meter, per the *Hydrologic and Hydraulic Model Protocol*. It was determined that the hydraulic model was adequately calibrated to represent dry weather flow conditions within the CSS. Refer to the C*SS Characterization Report* for details on the dry weather calibration results, meters used for calibration, and calibration statistics at each meter.

2.1.6.4 Wet Weather Calibration and Verification

The hydraulic model was calibrated and verified for wet weather flow modeling per the *Hydrologic and Hydraulic Model Protocol*. The model was determined to be adequately calibrated for running the CSS capture and overflow analysis events and continuous simulations. Refer to the C*SS Characterization Report* for details on the wet weather calibration results, meters used for calibration, and calibration statistics at each meter.

2.1.7 CSS Existing Conditions Hydraulic Performance

Utilizing the calibrated system model, continuous simulations quantified system performance and wet weather capture using the Design Year hyetograph. Capture volumes were totalized at each of the three CSS primary pump stations since all flow conveyed by these pump stations reaches the Kaw Point WWTP. Determining capture efficiencies at individual diversion structures is misleading since CSO diversion structures occur in series and are hydraulically interconnected skewing results. Therefore, percent wet weather capture for each pump station service area was calculated by summing the total of the overflows from individual diversions within a primary pump station service area and comparing that to the total capture during wet weather events by the pump station.

In performance of the continuous simulations a minimum inter-event time (MIT) between rainfall events of 12 hours was used. If a rainfall event begins within 12 hours of the previous event ending, this is considered one rainfall event. Given this assumption, the Design Year has 44 total annual rainfall events. To determine wet weather capture, the full year hydrograph from the Design Year continuous simulation at each primary pump station was entered into a spreadsheet along with the weekly dry-weather flow hydrograph, which recurs over the 52-week long year, and the Design Year rainfall hyetograph. Flows at the pump station begin to be totalized when a given rainfall event begins and the totalizing ends when wet weather flows drop to within 1.25 times the dry weather flow. Using this method, system capture volume is totalized during wet weather periods only, excluding the system capture that occurs during dry weather periods.

Table 2-4, Table 2-5, and Table 2-6 show the annual Design Year overflow statistics and percent wet-weather capture, based on the model simulations and calculation methodology described above, for existing conditions in the CSS. As indicated in Table 2-4, the existing CSS achieves a 70.5% wet weather capture. Although this is relatively high for a combined sewer system, it reflects the large amount of sewer separation that has occurred to date. Topography, land use, and other system characteristics as noted in Section 2.1.1 also contribute to the high existing overall wet weather capture.

Of the modeled 844 million gallons (MG) that overflows in the CSS during a Design Year, over half occurs in the FID Pump Station service area. As noted previously, the FID Pump Station is throttled back during large wet weather events when the Kaw Point WWTP hydraulic capacity is reached. This directs more overflow to the Missouri River and reduces overflow to the Kansas River.

Table 2-4: Existing Modeled CSS Overflow Conditions by Primary CSS Pump Station Service Area

Primary CSS Pump Station Service Area	Annual Wet Weather Capture Volume (MG)	Annual Overflow Volume (MG)	Percent Capture, Wet Weather Flow
FID Pump Station	612	479	56.1
CID Pump Station	17	0.14	99.2
AID Pump Station	1,386	365	79.1
Overall Combined Sewer System	2,015	844	70.5

As shown in Table 2-5, the largest CSOs (by volume) occur at CSOs 54, 44, and 43. These three CSOs account for more than 70% of the overflow volume during the Design Year. CSOs 54 and 44 along with seven other diversions activate during all 44 storm events that occur during the Design Year.

Table 2-5: Existing Modeled CSS Overflow Conditions by CSO Diversion Structure

CSO Diversion Structure	Annual Overflow Frequency	Annual Overflow Volume (MG)
Overall Combined Sewer System	**44**	**844.48**
FID Pump Station Basin	**44**	**478.74**
Jersey Creek	**44**	**76.28**
CSO 01	2	0.11
CSO 02	3	0.57
CSO 03	3	0.56
CSO 04	7	0.76
CSO 05	8	1.16
CSO 08	0	0.00
CSO 09	3	0.15
CSO 10	3	0.04
CSO 11	2	0.00
CSO 14	19	4.80
CSO 15	8	0.54
CSO 16	16	0.73
CSO 17	16	0.51
CSO 18	0	0.00
CSO 19	44	21.80
CSO 20[1]	0	0.00
CSO 21	0	0.00
CSO 22	1	0.00
CSO 23	1	0.01
CSO 25	7	0.06
CSO 26	4	0.25
CSO 53	2	0.05
CSO 55	44	35.69
CSO 62	2	0.03
CSO 65	4	0.10
CSO 80	16	0.53
CSO 81	17	0.76
CSO 82[1]	0	0.00
CSO 84	0	0.00
CSO 85	1	0.01

CSO Diversion Structure	Annual Overflow Frequency	Annual Overflow Volume (MG)
CSO 86	17	7.04
CSO 87[1]	0	0.00
Esplanade/FID	**44**	**402.45**
CSO 27	44	7.30
CSO 28	44	36.60
CSO 29	26	1.52
CSO 30	44	7.75
CSO 31	7	0.21
CSO 54	44	339.69
CSO 56	44	9.38
CID Pump Station Basin	**1**	**0.14**
CID	**1**	**0.14**
CSO 32	1	0.14
CSO 35[1]	0	0.00
CSO 36[1]	0	0.00
CSO 37[1]	0	0.00
CSO 68[1]	0	0.00
CSO 69[1]	0	0.00
CSO 83[1]	0	0.00
CSO 88[1]	0	0.00
AID Pump Station Basin	**44**	**365.37**
Splitlog Creek	**44**	**180.50**
CSO 39	17	1.13
CSO 44	44	179.28
Muncie Bluff Creek	**3**	**0.94**
CSO 64	3	0.94
Armourdale	**43**	**99.61**
CSO 41	2	0.09
CSO 42	17	9.27
CSO 43	43	85.13
CSO 66	25	5.12
Mattoon Creek	**3**	**0.14**
CSO 51	3	0.14
CSO 52	1	0.00

CSO Diversion Structure	Annual Overflow Frequency	Annual Overflow Volume (MG)
Argentine	**44**	**84.28**
CSO 47	44	2.61
CSO 48	24	81.67

Notes
1. CSO locations that have been closed due to previous sewer separation.

As shown in Table 2-6, over half of the CSO volume is discharged to the Missouri River (primarily from CSO 54). This is partially due to the throttling of the FID Pump Station.

Table 2-6: Existing Modeled CSS Overflow Conditions by Receiving Water

Receiving Water	Annual Overflow Frequency	Annual Overflow Volume (MG)
Overall Combined Sewer System	44	844
Kansas River[1]	44	365
Missouri River[2]	44	479
Jersey Creek	44	69
Mattoon Creek	3	0.14

Notes:
1. Kansas River overflow volume includes Mattoon Creek overflow volume.
2. Missouri River overflow volume includes Jersey Creek overflow volume.

2.2 Separate Sewer System

A system characterization documents a detailed understanding of the SSS and its performance in dry and wet weather. An analysis of existing data and field investigation results and monitoring and modeling of the SSS was performed to understand how the system responds to various wet weather events and the characteristics of any overflows. The system characterization established the baseline conditions that were used to evaluate level of service alternatives and assess the effectiveness of the proposed IOCP.

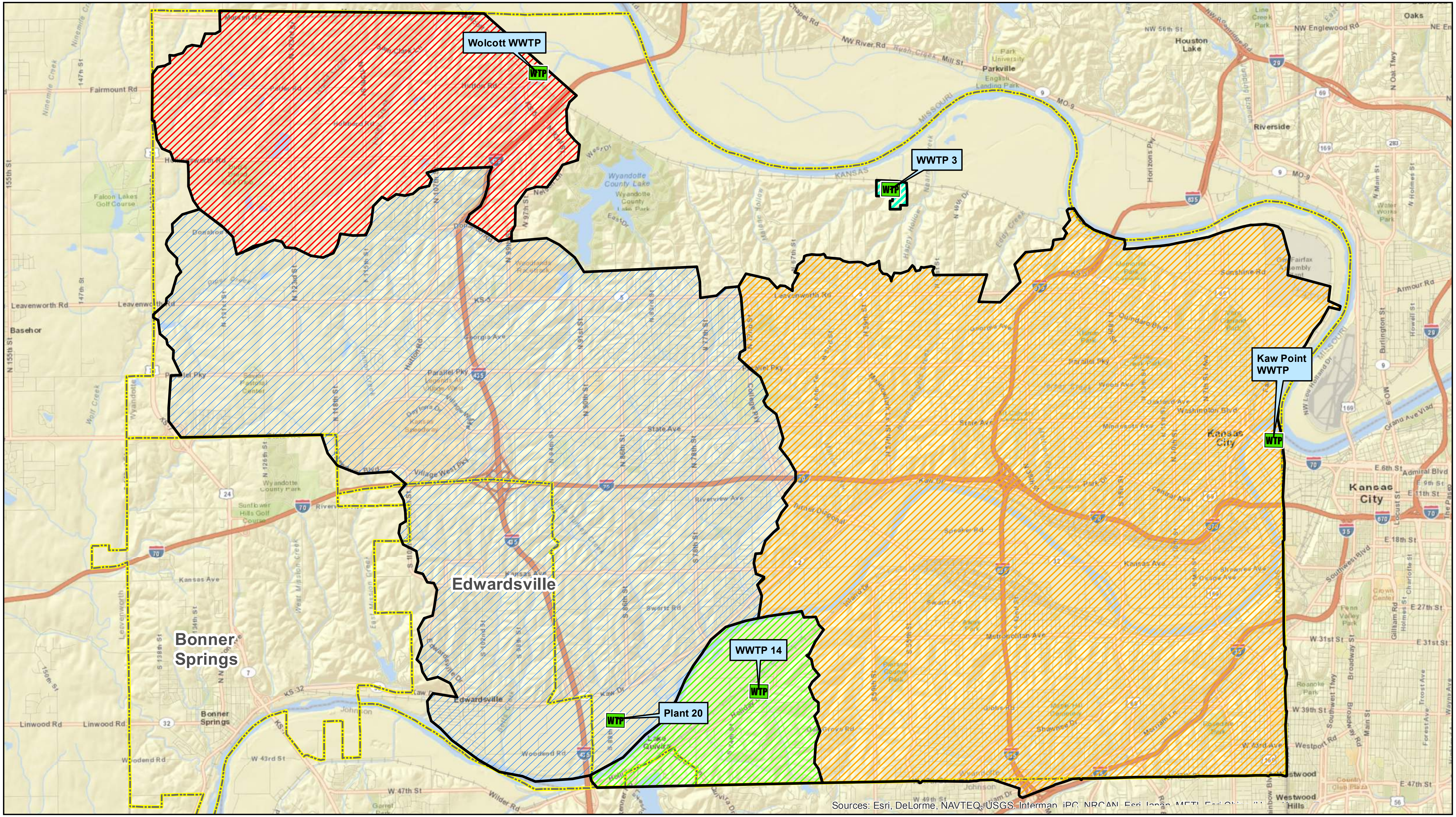
To characterize the existing system, the UG reviewed existing data, performed field investigations and flow and rainfall monitoring, performed hydraulic modeling and analysis, and developed preliminary SSO control alternatives. To document this effort, the UG submitted the *SSS Characterization Report* to the KDHE and the EPA on August 31, 2015. Refinements to hydraulic modeling and alternative development have continued beyond submittal of the *SSS Characterization Report;* these refinements are discussed in detail in the *SSS Characterization Report – Addendum No. 1*. A brief description of the SSS, a summary of key findings of the characterization process, and updated information from additional refinement efforts are summarized in this Section.

2.2.1 SSS Basins

The SSS portion of the UG's service area is generally located west of Interstate 635 and extends south from the Missouri River to Johnson County, Kansas, and west to approximately Kansas Highway 7 as shown previously on Figure 1-1. The SSS basins discharge to four wastewater treatment plants: Plant 20, Wolcott WWTP, WWTP 14, and WWTP 3.

The SSS can be sub-divided into 33 subbasins and five main service areas based on the areas tributary to the four WWTPs in the SSS as shown on Figure 2-6, Figure 2-7, and Figure 2-8.

- Plant 20 services the southern region of the service area and is located near Kansas Highway 32 and Interstate 435. Plant 20 receives flow from the majority of the SSS including the following: Betts Creek, Grinter Creek, Little Turkey Creek North, Little Turkey Creek South, Little Turkey Tributary North, Little Turkey Tributary South, Marshall Creek, Mill Creek, Timmons Creek, and Wolf Creek Basins. PS 6 is the primary influent pump station to Plant 20. A pump station located in the City of Edwardsville also pumps the city's wastewater to Plant 20 for treatment.
- Wolcott WWTP services the northern region of the service area and is located near Wolcott Drive and Interstate 435. Wolcott WWTP receives flow from the following: Connor Creek, Honey Creek, Island Creek, Island Creek Tributary, Piper Creek, and Pomeroy Creek Basins. PS 70 is the primary influent pump station to the Wolcott WWTP.
- WWTP 14 services a small area located south of the Kansas River. WWTP 14 receives flow from the Morris Creek and Tooley Creek Basins.
- WWTP 3 only services a small healthcare facility and the sanitary waste from a nearby water treatment facility.
- Kaw Point WWTP receives flow from the following SSS basins tributary to the CSS: Eddy Creek, Brenner Heights Creek, Indian Creek, Santa Fe Bluff, Muncie Creek, Little Muncie, Union Pacific Bottoms, Barber Creek, Turner Creek, Turkey Creek, and Brush Creek Basins.



LEGEND

City Boundary

Sewer Service Area

- Plant 20
- Wolcott WWTP
- WWTP 14
- WWTP 3
- Kaw Point WWTP

N

0 2 4 Miles

Data Sources: HDR Inc, ESRI
Coordinate System: NAD_1983_StatePlane_Kansas_North_FIPS_1501

Figure 2-6

Wastewater Treatment Plant Service Areas

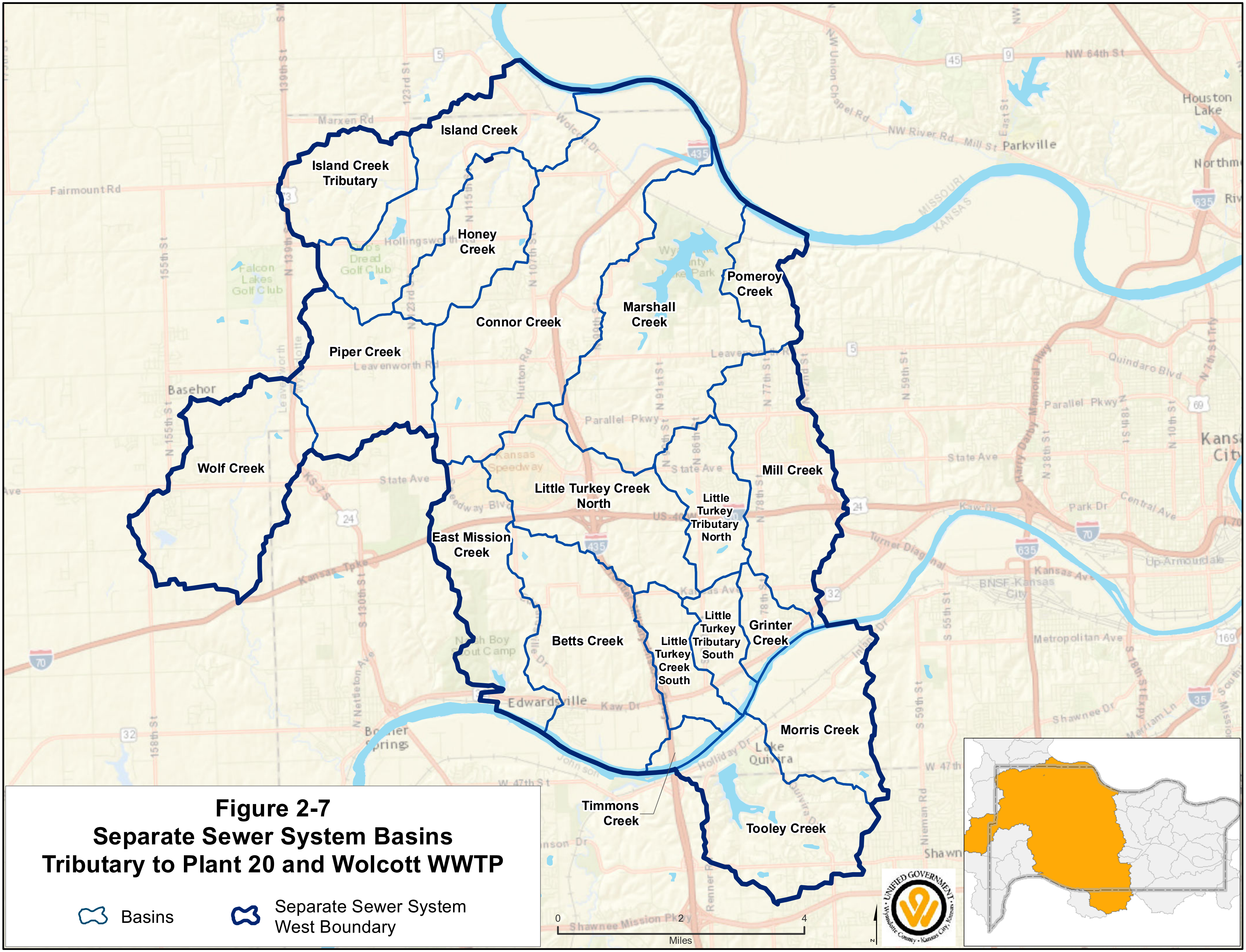


Figure 2-7
Separate Sewer System Basins Tributary to Plant 20 and Wolcott WWTP

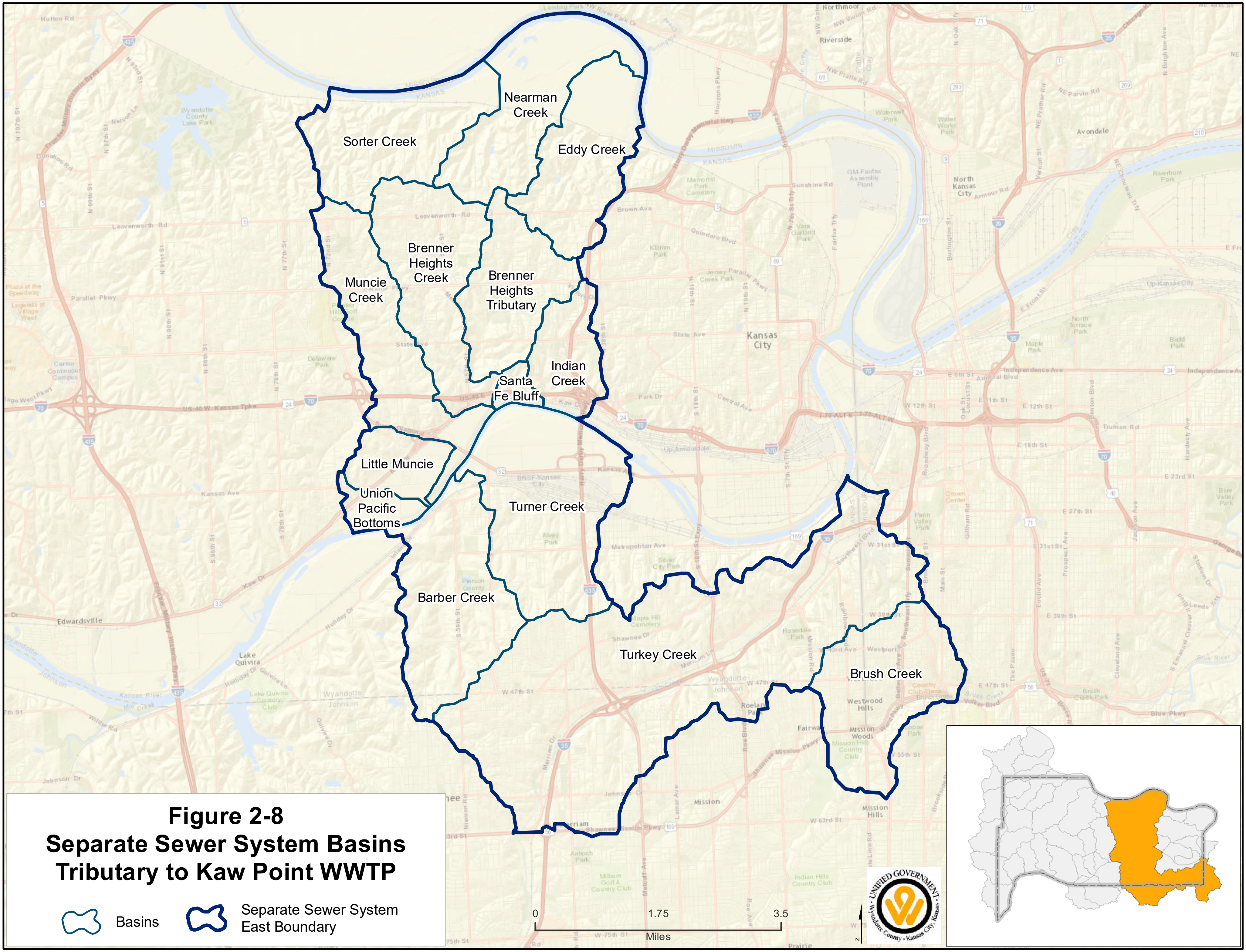


Figure 2-8
Separate Sewer System Basins Tributary to Kaw Point WWTP

The terrain within the SSS generally consists of rolling hills in upland areas between the main river plains of the Missouri River to the north and the Kansas River to the south. The upland areas contain mixed development consisting of both residential and commercial development. A limited amount of light industrial area is present south of Kansas Highway 32 and near the Kansas River.

2.2.2 Gravity Sewer System

Comprised of over 400 miles of 6- to 48-inch diameter pipe, the SSS gravity sewer inventory is provided in Table 2-7.

Table 2-7: SSS Gravity Sewer Inventory

Basin	Area (ac)	Sewer Length (ft)
Betts Creek	4,097	0
Connor Creek	7,650	191,230
Grinter Creek	741	20,379
Honey Creek	2,170	21,124
Island Creek	3,792	50,874
Island Creek Tributary	1,977	4,696
Little Turkey Creek North	3,569	64,473
Little Turkey Creek South	1,222	0
Little Turkey Tributary North	1,702	120,135
Little Turkey Tributary South	966	12,068
Marshall Creek	6,027	127,859
Mill Creek	3,578	292,086
Morris Creek	2,738	17,961
Piper Creek	2,891	19,066
Pomeroy Creek	1,225	0
Timmons Creek	381	648
Wolf Creek	3,602	34,939
Eddy Creek	1,983	47,834
Brenner Heights Creek	2,209	199,286
Brenner Heights Tributary	1,653	165,734
Indian Creek	954	54,057
Santa Fe Bluff	193	0
Muncie Creek	2,137	138,243
Little Muncie	730	25,285
Union Pacific Bottoms	364	5,463
Barber Creek	2,581	47,227
Turner Creek	3,218	95,474

Basin	Area (ac)	Sewer Length (ft)
Turkey Creek	9,143	502,994
Brush Creek	2,298	40,741
Total	75,791	2,299,876

Source: UG GIS data (September 1, 2016).

2.2.3 Pump Stations and Force Mains

The UG owns and operates 65 pump stations in the SSS as indicated in Table 2-8. A pump station flow schematic is provided on Figure 2-9. Two pump stations, PS 10 and PS 16, utilize storage onsite for excess flows. Access to these storage basins is controlled with fencing and lockable gates.

Table 2-8: SSS Pump Station and Force Main Inventory

Pump Station ID[1]	Basin	WWTP Basin	Address	Pump Rated Capacity[2] (gpm)	Tested Capacity[3] (gpm)	Force Main Diameter (in)	Force Main Length (ft)	Force Main Pipe Material
4	Turner Creek	Kaw Point WWTP	3770 Fairbanks Avenue (Santa Fe East)	1@3,000; 2@3,500	1 - 2,363 2 - 2,945 3 - 2,607	16	2,770	CIP
5	Turner Creek	Kaw Point WWTP	5091 Kansas Avenue (Santa Fe West)	1@1,400; 2@1,150	1 - 1,005 2 - 1,140 3 - 1,052	12	1,285	PCCP
6	Little Turkey Tributary South	Plant 20	8260 Kaw Drive	3@7,100	1 - 5,150 2 - 4,600 3 - 7,350	30	5,850	DIP
7	Muncie Creek	Kaw Point WWTP	5611 Kaw Drive	2@2,080; 2@1,340	1 - 1,727 2 - 1,776 3 - 1,310 4 - 1,248	30	18,400	DIP
8	Mill Creek	Plant 20	7544 Richland Avenue	2@11 (Grinder)	Not tested	1.25	600	HDPE
9	Indian Creek	Kaw Point WWTP	800 North 41st Street	1@100	1 - 87	4	328	DIP
10	Marshall Creek	Plant 20	3120 North 83rd Street	2@125	1 - 54 2 - 54	4	1,600	CIP
11	Little Turkey Tributary North	Plant 20	9191 Minnesota Avenue	2@80	1 - 54 2 - 54	4	1,030	CIP
13	Mill Creek	Plant 20	1400 North 74th Street	2@150	1 - 167 2 - 161	4	45	PVC
14	Turkey Creek	Kaw Point WWTP	2080 South 18th Street	2@160	1 - 105 2 -101	4	354	CIP
15	Connor Creek	Plant 20	10614 Rowland Avenue	2@210	1 - 198 2 - 201	4	185	PVC

Pump Station ID[1]	Basin	WWTP Basin	Address	Pump Rated Capacity[2] (gpm)	Tested Capacity[3] (gpm)	Force Main Diameter (in)	Force Main Length (ft)	Force Main Pipe Material
16	Island Creek	Wolcott WWTP	11800 Polfer Road	4@250	1 - 365 2 - 360	6	12,690	PVC
18	Barber Creek	Kaw Point WWTP	5830 Inland Drive (Old Plant #8)	3@650	1 - 1,004 2 - 980 3 - 949	10	10,500	DIP
19	Argentine	Kaw Point WWTP	1196 South 39th Street	2@150	1 - 215 2 - 170	6	500	CIP
20	Turner Creek	Kaw Point WWTP	1006 South 49th Drive	2@200	1 - 200 2 - 174	4	450	CIP
21	Turner Creek	Kaw Point WWTP	898 South 51st Street	2@250	1 - 364 2 - 355	6	1,350	CIP
22	Turner Creek	Kaw Point WWTP	630 South 54th Street	2@100	1 - 96 2 - 99	4	380	CIP
23	Little Muncie	Kaw Point WWTP	6020 Kansas Avenue	2@100	Not tested	4	1,420	CIP
24	Little Muncie	Kaw Point WWTP	388 South 65th Street	2@350	1 - 362 2 - 329	6	230	DIP
25	Eddy Creek	Kaw Point WWTP	3356 North 34th Street	2@120	1 - 205	6	1,020	CIP
26	Eddy Creek	Kaw Point WWTP	3231 North 38th Street	2@103	Not tested	4	480	CIP
27	Eddy Creek	Kaw Point WWTP	2998 North 42nd Street	2@200	1 - 189 2 - 187	6	2,300	DIP
28	Eddy Creek	Kaw Point WWTP	2830 North 44th Street	2@250	1 - 211 2 - 216	6	2,100	CIP
29	Eddy Creek	Kaw Point WWTP	3022 North 48th Street	2@100	1 - 113 2 - 147	6	1,020	CIP

Pump Station ID[1]	Basin	WWTP Basin	Address	Pump Rated Capacity[2] (gpm)	Tested Capacity[3] (gpm)	Force Main Diameter (in)	Force Main Length (ft)	Force Main Pipe Material
30	Marshall Creek	Plant 20	3240 North 84th Place	2@100	1 - 68 2 - 69	4	920	CIP
31	Union Pacific Bottoms	Kaw Point WWTP	388 South 65th Street	2@580	1 - 626 2 - 542	6	400	DIP
32	Turkey Creek	Kaw Point WWTP	1865 St. Paul Street	2@100	1 - 100 2 - 77	4	450	PVC
32A	Turkey Creek	Kaw Point WWTP	613 Douglas Avenue	2@9	Not Tested	2	500	PVC
33	Timmons Creek	Plant 20	2480 South 88th Street	2@250	1 - 921 2 - 1,002	8	1,484	DIP
34	Eddy Creek	Kaw Point WWTP	3225 North 46th Street	2@100	1 - 98 2 - 110	4	930	DIP
35	Indian Creek	Kaw Point WWTP	4325 State Avenue	2@100	1 - 201 2 - 201	4	525	CIP
36	Marshall Creek	Plant 20	2847 North 99th Street	2@500	1 - 528 2 - 506	8	2,400	DIP
37	Brush Creek	Kaw Point WWTP	4607 Cambridge Street	2@565	Not tested	10	3,950	DIP
39	Turkey Creek	Kaw Point WWTP	1830 South 13th Street (BPU)	2@75	1 - 120 2 - 113	4	535	CIP
40	Argentine	Kaw Point WWTP	625 Metropolitan Avenue	2@450	1 - 434 2 - 432	10	1,000	DIP
41	Marshall Creek	Plant 20	3252 North 91st Street	4@1,350	1 - 246 2 - 632 3 - 1,126 4 - 112	8 & 12	15,400	PVC

Pump Station ID[1]	Basin	WWTP Basin	Address	Pump Rated Capacity[2] (gpm)	Tested Capacity[3] (gpm)	Force Main Diameter (in)	Force Main Length (ft)	Force Main Pipe Material
42	Turner Creek	Kaw Point WWTP	4801 Steele Road	2@210	1 - 178 2 -195	4	470	DIP
43	Grinter Creek	Plant 20	8009 Kansas Avenue	2@100	1 -134 2 -140	4	1,500	PVC
44	Betts Creek	Plant 20	880 South 9th Street (Kaw River Edwardsville)	4@2,400	1 - 1,943 2 - 1,524 3 - 1,904 4 - 1,840	12	12,519	PVC
45	Brenner Heights Creek	Kaw Point WWTP	401 North 57th Street	3@1,680	1 -1,350 2 -1,760 3 -1,070	18	1,350	DIP
46	Grinter Creek	Plant 20	831 South 78th Street	2@160	Not tested	4	1,730	PVC
48	Morris Creek	WWTP 14	7324 Oliver Avenue	2@190	1 - 114 2 - 105	4	3,555	PVC
49	Turner Creek	Kaw Point WWTP	2059 South 50th Street	2@100	1 - 91 2 -82	4	680	PVC
50	Connor Creek	Plant 20	10515 Donahoo Road	3@3,100	1 - 2,390 2 - 3,120 3 - 2,090	20	10,100	DIP
53	Turkey Creek	Kaw Point WWTP	3198 Woodview Ridge Drive	2@90	1 - 92 2 - 85	4	445	PVC
54	Connor Creek	Plant 20	8054 Leavenworth Road	2@300	1 - 296 2 - 293	6	1,780	PVC
55	Esplanade Creek	Kaw Point WWTP	3500 North 27th Street	2@150	1 - 65 2 - 114	4	450	CIP
56	Turner Creek	Kaw Point WWTP	1399 South 55th Street	2@165	1 - 219 2 - 197	4	810	PVC

Pump Station ID[1]	Basin	WWTP Basin	Address	Pump Rated Capacity[2] (gpm)	Tested Capacity[3] (gpm)	Force Main Diameter (in)	Force Main Length (ft)	Force Main Pipe Material
57	Turner Creek	Kaw Point WWTP	5098 Douglas Avenue	2@340	1 - 99 2 - 95	4	1,480	PVC
60	Marshall Creek	Plant 20	2938 North 103rd Terrace	2@200	1 - 190 2 - 176	6	700	DIP
61	Honey Creek	Wolcott WWTP	123rd Street and Donahoo Road	2@150	1 - 139 2 - 154	4	1,620	PVC
62	Turner Creek	Kaw Point WWTP	1599 South 45th Street	2@200	1 - 168 2 - 187	6	1,750	PVC
63	Piper Creek	Plant 20	123rd Street and Leavenworth Road	2@150	1 - 112 2 - 129	4	1,400	PVC
64	East Mission Creek	Plant 20	11740 State Avenue	3@1,350	1 - 940 2 - 1,380 3 - 1,290	14	9,300	HDPE
65	Wolf Creek	Plant 20	12898 State Avenue	3@1,315	1 - 1,050 2 - 1,050 3 - 960	14	10,150	HDPE
66	Honey Creek	Wolcott WWTP	10910 Hollingsworth Road	2@110	1 - 360 2 - 341	4 & 8	88 (4-inch) 2,003 (8-inch)	PVC
67	Piper Creek	Plant 20	North 128th Street (Whispering Pines)	2@350	1 - 406 2 - 392	6	3,400	PVC
69	Island Creek	Wolcott WWTP	North 120th Street (Genesis Trace)	2@200	1 - 259 2 - 244	4	1,100	PVC
70	Connor Creek	Wolcott WWTP	5425 North 99th Street	2@600	1 - 625 2 - 600	8	3,120	HDPE
72	Connor Creek	Plant 20	10651 Augusta Drive (Highlands at Piper)	2@155	1 - 216 2 - 220	4	540	PVC

Pump Station ID[1]	Basin	WWTP Basin	Address	Pump Rated Capacity[2] (gpm)	Tested Capacity[3] (gpm)	Force Main Diameter (in)	Force Main Length (ft)	Force Main Pipe Material
73	Connor Creek	Plant 20	10500 Augusta Drive (Highlands at Piper)	2@195	1 - 220 2 - 213	4	20	PVC
74	Marshall Creek	Plant 20	1910 North 92nd Terrace (Sunset Ridge)	2@80	1 - 88 2 - 86	4	425	PVC
78	Island Creek Tributary	Wolcott WWTP	12708 Hubbard Road (Freeman Farm East)	2@200	1 - 358 2 - 354	4	479	PVC
79	Island Creek Tributary	Wolcott WWTP	5229 North 130th Terrace (Freeman Farm West)	2@11.5	Not tested	2	1,207	PVC
80	Brenner Heights Tributary	Kaw Point WWTP	5837 Walker Avenue	2@100	Not tested	4	886	PVC

Notes:
1. PS 12 and PS 68 have recently been removed from service. PS 59, PS 71, PS 76, and PS 77 are constructed; however, they are not in service. PS 83 and PS 84 are owned by the City of Edwardsville; the UG only maintains these pump stations.
2. Pump nameplate capacity.
3. Tested capacity of individual pumps per *Pump Station Evaluation Summary Report, Part 1 and Part 2.*

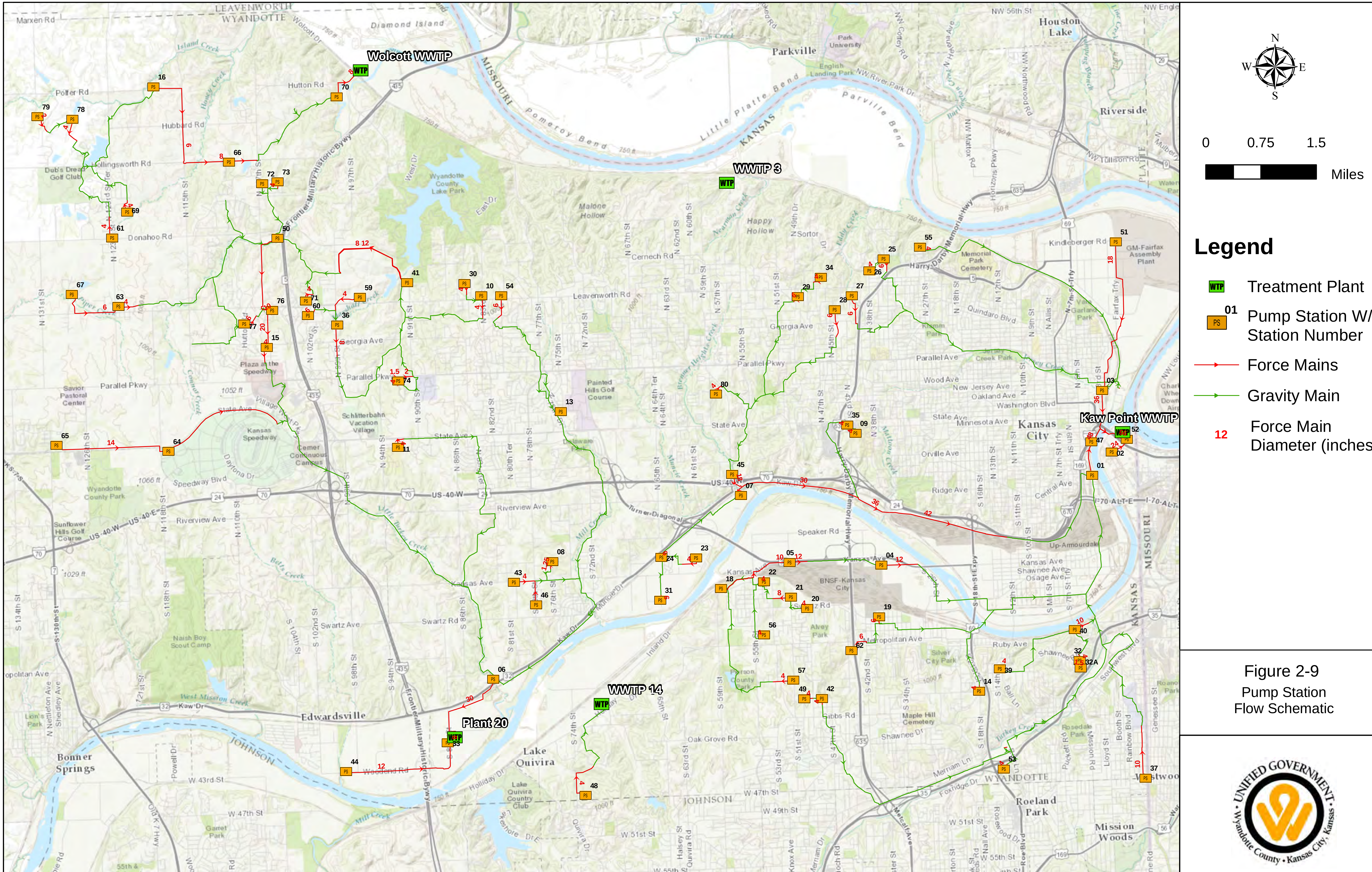


Figure 2-9
Pump Station Flow Schematic

2.2.4 Wastewater Treatment Plants

2.2.4.1 Plant 20

Plant 20 lies in the southwest portion of the UG service area, located east of Interstate 435 and south of Kansas Highway 32. The legal description is NW ¼, Section 32, Township 11 South, Range 24 East. The plant is within the Little Turkey Creek South Basin, approximately 2,000 feet northwest of the Kansas River, although the plant services several additional adjacent basins. Approximately 990,000 linear feet of sanitary sewer and 23 pump stations convey flow to Plant 20, including a pump station located in the City of Edwardsville that pumps the city's wastewater to Plant 20 for treatment. The plant location and service area are shown on Figure 2-6.

The plant was constructed in 1976. The original facility included two drum screens, two grit chambers, two primary clarifiers, two aeration basins, two final clarifiers, and flow metering. Sludge was digested in an aerobic digester, thickened in sludge basins, dewatered by belt filter press, and ultimately incinerated.

In 2001, improvements were made to the WWTP. One mechanical bar screen and vortex grit basin motors were replaced at the headworks. Both aeration basins were converted to fine bubble aeration. Density current baffles were installed on both final clarifiers. Plant effluent routing was adjusted and a UV disinfection facility was constructed. As part of this project, the existing incinerator was decommissioned; dewatered sludge is now conveyed to sludge roll-off containers for hauling to disposal.

The KDHE issued a permit and authorization to discharge under the NPDES, effective October 1, 2012. The NPDES Permit expires on December 31, 2016. The plant permit specifies a 7.0 mgd design flow.

2.2.4.2 Wolcott WWTP

The Wolcott WWTP lies in the northwest portion of the UG service area, located west of Interstate 435 and north of Wolcott Drive. The legal description is NE 1/4, Section 12, Township 10 South, Range 23 East. The plant serves the following basins: Island Creek Tributary, Island Creek, Honey Creek, and north quarter of Connor Creek Basins. Approximately 130,000 linear feet of sanitary sewer and seven pump stations convey flow to the Wolcott WWTP. The plant location and service area are shown on Figure 2-6.

The Wolcott WWTP, an interim package treatment plant, was purchased from the City of Gardner, Kansas, in 2007. The plant includes a rectangular biological treatment tank with an anaerobic chamber, anoxic chamber, aeration chamber, and an aerobic digester compartment. The plant also includes a final clarifier, UV disinfection units, and flow-metering manhole. Sludge is removed from an aerobic digester by vacuum truck for hauling and disposal.

The KDHE issued a permit and authorization to discharge under the NPDES, effective April 1, 2013. The NPDES Permit expires on March 31, 2018. The plant permit identifies a 0.288 mgd design average daily flow.

2.2.4.3 WWTP 14

WWTP 14 is located in the Morris Creek Basin. The Morris Creek Basin is the only basin that conveys wastewater to WWTP 14. WWTP 14 serves a total area of 120 acres, approximately 85 acres are residential and 35 acres are industrial. The plant consists of an oxidation ditch, final clarifier, and UV disinfection facility. Sludge is stored onsite in a storage tank. The plant location and service area are shown on Figure 2-6.

The KDHE issued an NPDES Permit and authorization, effective October 1, 2012, for WWTP 14 to discharge into the Kansas River via an unnamed tributary creek. The NPDES Permit expires on December 31, 2016. The plant permit identifies a 0.12 mgd design average daily flow. Based on the design flows defined in the WWTP 14 Improvements (2005) construction documents, the plant has a peak design capacity of 0.58 mgd.

2.2.4.4 WWTP 3

WWTP 3 is located on Brenner Drive in the extreme northern part of the service area near the Missouri River. The plant is in a predominantly unsewered part of the community, and serves only a behavioral health hospital and sanitary waste from a water treatment facility. The sewer system delivering flow to the plant is privately owned and operated.

The plant consists of a Smith & Loveless package "Oxigest" activated sludge plant, final clarifier, and UV disinfection facility. The KDHE issued an NPDES Permit and authorization, effective July 1, 2013, for WWTP 3 to discharge into the Missouri River via Sortor Creek. The NPDES Permit expires on June 30, 2018. The plant permit identifies a 10,000-gpd design flow. The plant operates well within its capacity and discharge limits.

2.2.5 SSS Hydraulic Modeling

Similar to the CSS hydraulic modeling, the principal tool used in assessing the capacity of the SSS was a dynamic hydraulic system model that was developed, calibrated and verified on the basis of sewer system flow and rainfall data obtained from a monitoring system specifically established and operated for that purpose. Innovyze's InfoWorks ICM was used for modeling the SSS. The sewer system model couples base flow, precipitation, subcatchment information, and conveyance system information with hydrologic and hydraulic calculating procedures to simulate sewer system flow characteristics. This tool supports the engineering analysis necessary to plan sewer system improvements.

2.2.5.1 Hydraulic Model Configuration

The SSS hydraulic model included the following:

- All gravity interceptor sewers 15 inches in diameter and larger; all other sewers to points at least 1,000 feet upstream of known recurring SSOs, emergency overflows, and force mains serving major pump stations (capacity of 1,000 gpm minimum or greater).
- Additional pump stations within the project area necessary to complete dry and wet weather flow calibration and verification.
- Discharge points to wastewater treatment plants.
- Drainage area characteristics for each tributary sub-basin.

The hydraulic model includes 15 control structures in the SSS area of the model, all of which are located in the basins tributary to the Kaw Point WWTP. The hydraulic model contains 14 pump stations in the SSS area. A detailed listing of the hydraulic control structures is contained in the *SSS Characterization Report*.

2.2.5.2 Dry Weather Calibration and Verification

The model was calibrated to both a weekday and weekend dry weather hydrograph created from the hourly aggregated dry weather flow data for each flow meter, per the *Hydrologic and Hydraulic Model Protocol*. It was determined that the hydraulic models were adequately calibrated to represent dry weather flow conditions within the SSS. Refer to the *SSS Characterization Report* for details on the dry weather calibration results and meters used for calibration.

2.2.5.3 Wet Weather Calibration and Verification

The hydraulic model was calibrated and verified for wet weather flow modeling per the *Hydrologic and Hydraulic Model Protocol*. The model was determined to be adequately calibrated for running the capacity analysis events. Refer to the *SSS Characterization Report* for details on the wet weather calibration results and meters used for calibration.

2.2.6 SSS Hydraulic Capacity Analysis

A capacity analysis was performed to establish modeled flow restrictions, overflow occurrences and volumes, basement flooding locations, and causes of these capacity issues for the SSS basins for both existing conditions and potential 20-year planning period (Year 2033) conditions.

These existing and future conditions capacity analyses were performed per the hydraulic modeling protocols defined in the *SSE Work Plan*, using two-year and five-year recurrence interval, 24-hour duration rainfall events to aid in determining the “Level of Service Range” for the system. The calibrated sewer system model was used to estimate existing flows (hydrographs, peak flow rate and flow volume) that are conveyed by the system or lost to the environment. Model runs were required to evaluate existing system capacity (Year 2013) and capacity for future conditions (Year 2033), without improvements, for the SSS. These results were used in the development of the alternatives analysis to develop wet weather controls.

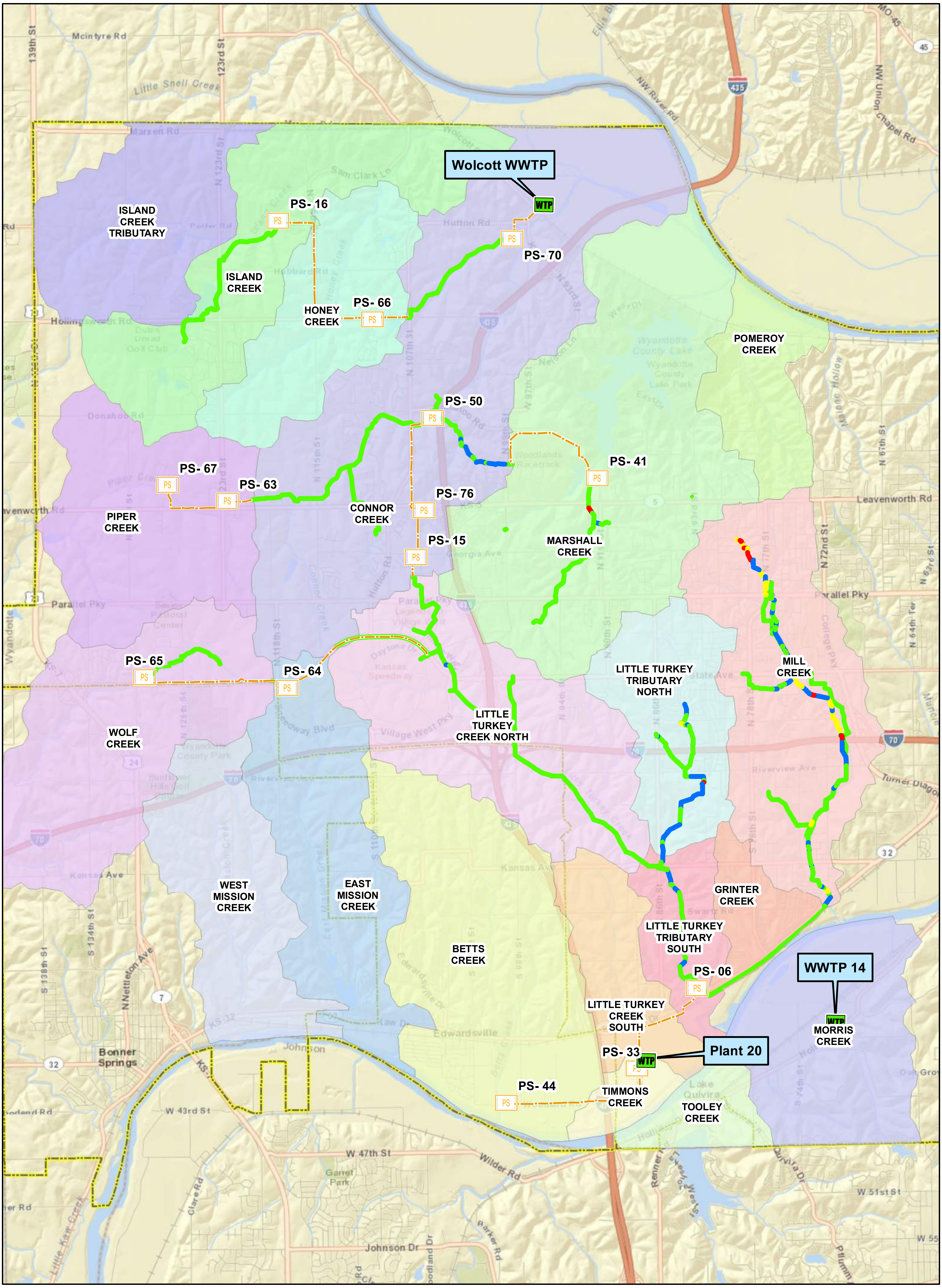
The Year 2013 and Year 2033 hydraulic model was set up and run using the hydraulic model from the dry weather run and adding a second 24-hour period with the two-year 24-hour storm event occurring in the second 24-hour time block to represent the addition of the wet weather flows in the SSS. This same methodology was used for the five-year 24-hour storm event. This was completed with the existing model configuration to determine the amount of overflow and surcharging within the system.

The model analysis was performed with two separate models; one model included all SSS basins tributary to the Kaw Point WWTP and one model included all SSS basins tributary to Plant 20 and the Wolcott WWTP. These two model areas do not have any cross connections or basin interactions; therefore, it was appropriate to construct separate models for these two areas.

The primary focus of this hydraulic capacity analysis was to identify the potential future flow restrictions that may impact the selection and sizing of the appropriate alternative(s) to address both existing and potential future capacity issues.

2.2.6.1 Existing Gravity Collection System Capacity Analysis

Graphical representations of the hydraulically modeled collection system with basic pipe percent utilization for existing conditions were prepared. The collection system capacity analysis for a two-year storm event is shown on Figure 2-10 for those basins tributary to Plant 20 and the Wolcott WWTP and on Figure 2-11 for those basins tributary to the Kaw Point WWTP. Similar figures are shown for a five-year storm event on Figure 2-12 and Figure 2-13. The pipes are color-coded based on the various levels of capacity utilization, e.g., pipes with inadequate capacity for the storm event flows are indicated in yellow and red.



Legend

City Boundary

Basin Boundary

Pump Stations

Treatment Plant

UG Existing Force Main

Sewer Capacity Utilizationn Modeled Lines

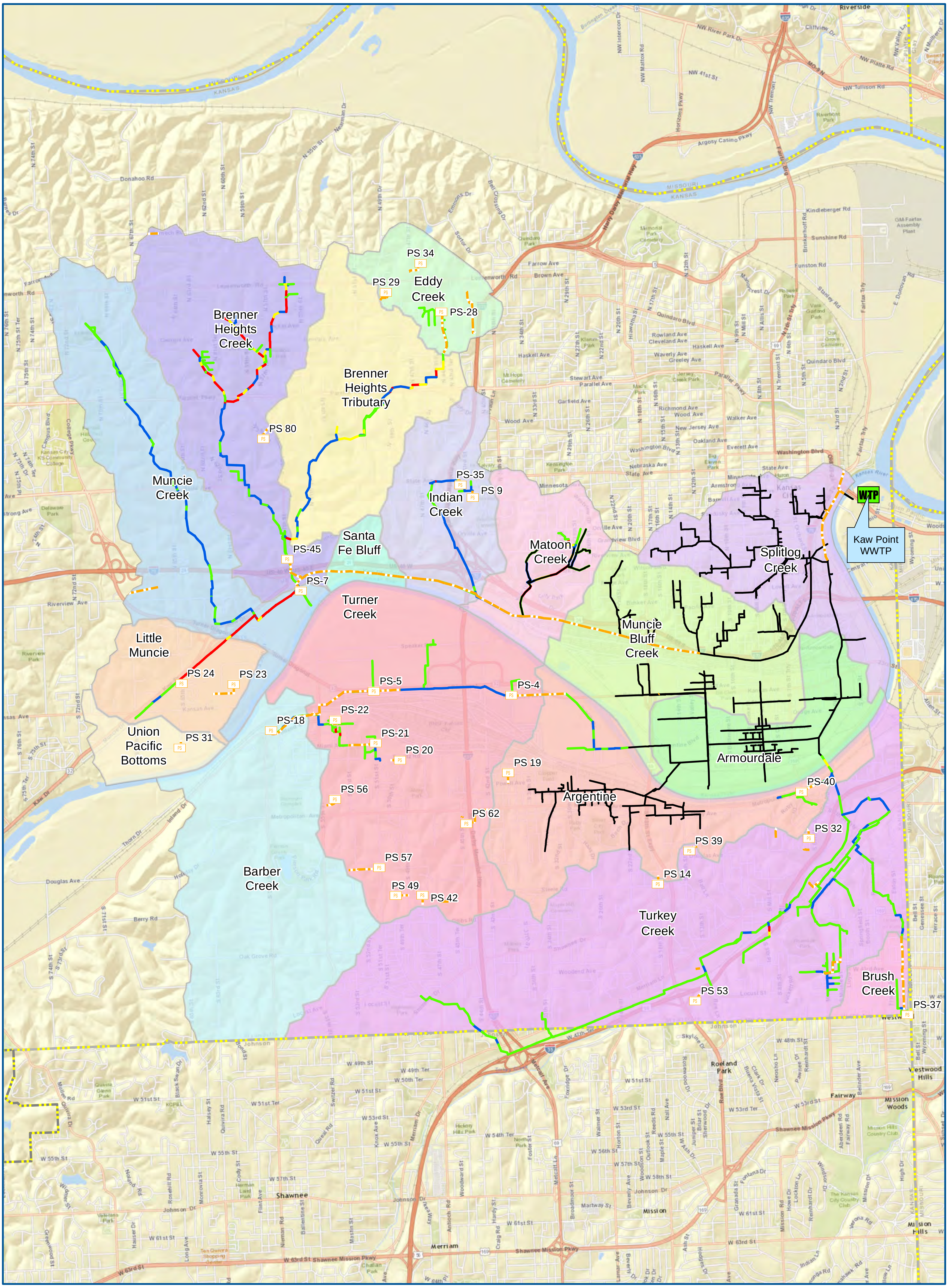
- < 50%
- 50-100%
- 100-150%
- > 150%

0 1 2 Miles

Data Sources: HDR Inc, ESRI
Coordinate System: NAD_1983_StatePlane_Kansas_North_FIPS_1501

Figure 2-10

Capacity Analysis for Two-Year Storm Event for Basins Tributary to Plant 20 and Wolcott WWTP (Year 2013)



Legend

- City Boundary
- Basin Boundary
- Pump Stations
- Treatment Plant
- UG Existing Force Main
- CSS Modeled Pipes

Sewer Capacity Utilization

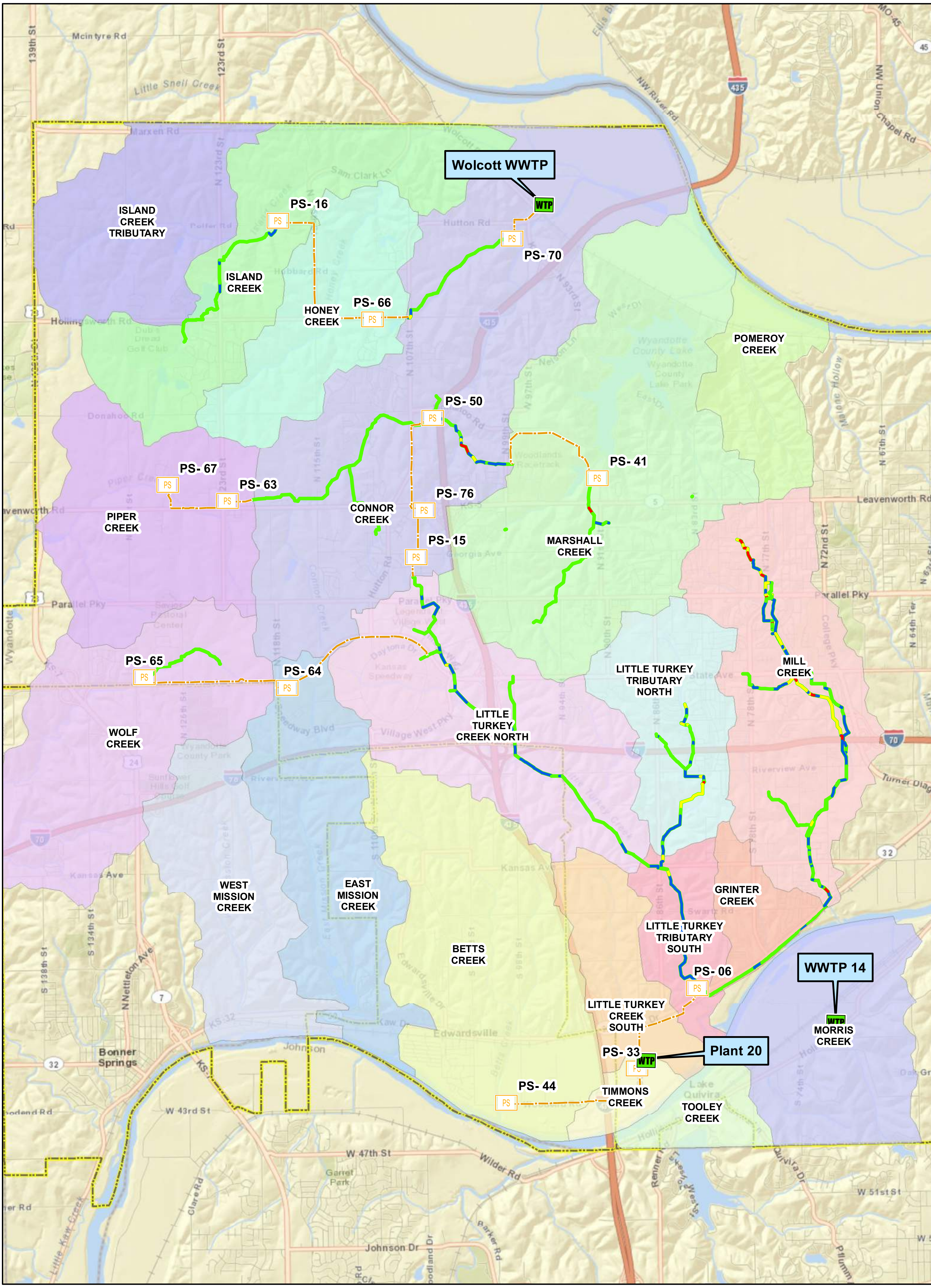
- <50%
- 50% - 100%
- 100% - 150%
- >150%

0 1 2 Miles

Data Sources: B&V, ESRI
Coordinate System: NAD_1983_StatePlane_Kansas_North_FIPS_1501

Figure 2-11

Capacity Analysis for Two-Year Storm Event for Basins Tributary to Kaw Point WWTP (Year 2013)



Legend

- City Boundary
- Basin Boundary
- PS Pump Stations
- WTP Treatment Plant
- UG Existing Force Main

Sewer Capacity Utilization Modeled Lines

- < 50%
- 50-100%
- 100-150%
- > 150%

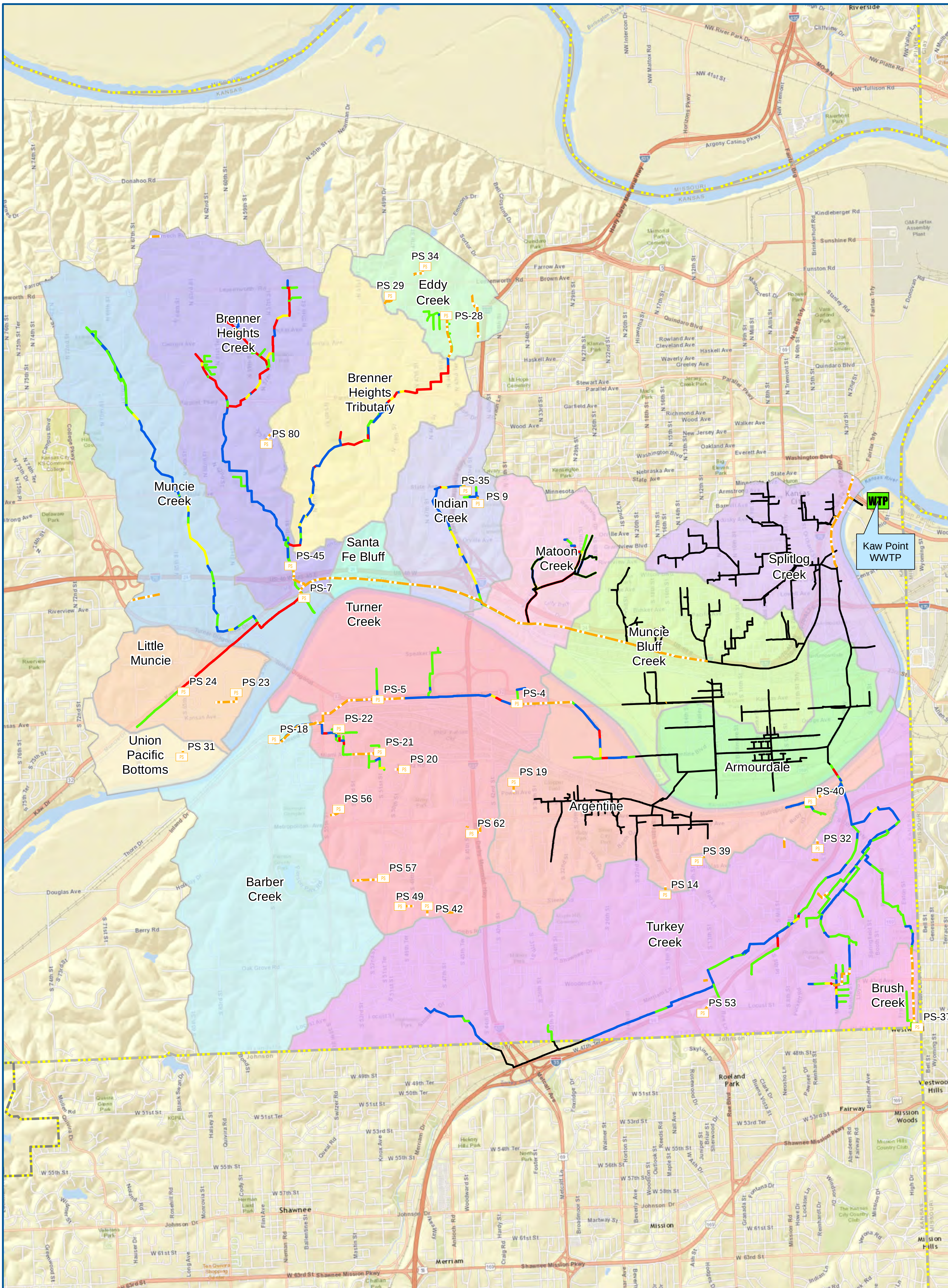
N

0 1 2 Miles

Data Sources: HDR Inc, ESRI
Coordinate System: NAD_1983_StatePlane_Kansas_North_FIPS_1501

Figure 2-12

Capacity Analysis for Five-Year Storm Event for Basins Tributary to Plant 20 and Wolcott WWTP (Year 2013)



Legend

- City Boundary
- Basin Boundary
- Pump Stations
- Treatment Plant
- UG Existing Force Main
- CSS Modeled Pipes

Sewer Capacity Utilization

- <50%
- 50% - 100%
- 100% - 150%
- >150%

0 1 2 Miles

Data Sources: B&V, ESRI
Coordinate System: NAD_1983_StatePlane_Kansas_North_FIPS_1501

Figure 2-13

Capacity Analysis for Five-Year Storm Event for Basins Tributary to Kaw Point WWTP (Year 2033)

A summary of the pipe utilizations for a two-year storm event and a five-year storm event (Year 2013) by footage of pipe for basins tributary to Plant 20 and the Wolcott WWTP, and tributary to Kaw Point WWTP is presented in Table 2-9 and Table 2-10, respectively.

Table 2-9: Sewer Capacity Utilization for Two- and Five-Year Storm Events, Basins Tributary to Plant 20 and Wolcott WWTP (Year 2013)

Metric	Two-Year Storm Event	Five-Year Storm Event
Total Length of System Modeled	193,285 ft	193,285 ft
<50% Capacity Utilization	162,359 ft (84%)	126,243 ft (66%)
50 to 100% Capacity Utilization	23,194 ft (12%)	49,304 ft (26%)
100 to 150% Capacity Utilization	5,798 ft (3%)	13,361 ft (7%)
>150% Capacity Utilization	1,932 ft (1%)	4,377 ft (2%)
Length of Modeled System in Surcharge	7,730 ft (4%)	17,738 ft (9%)

Table 2-10: Sewer Capacity Utilization for Two- and Five-Year Storm Events, Basins Tributary to Kaw Point WWTP (Year 2013)

Metric	Two-Year Storm Event	Five-Year Storm Event
Total Length of System Modeled	274,782 ft	274,782 ft
<50% Capacity Utilization	175,036 ft (64%)	125,301 ft (46%)
50 to 100% Capacity Utilization	53,583 ft (20%)	68,970 ft (25%)
100 to 150% Capacity Utilization	14,289 ft (5%)	28,577 ft (10%)
>150% Capacity Utilization	30,776 ft (11%)	51,110 ft (19%)
Length of Modeled System in Surcharge[1]	108,539 ft (40%)	154,428 ft (56%)

Note:
1. Total length of surcharge also includes length of pipe surcharged due to backwater conditions.

Flow restrictions within the SSS identified through hydraulic modeling for existing conditions during the two-year storm event are summarized below (refer to Figure 2-10 and Figure 2-11):

- Mill Creek Basin:
  - In the northern portion of the basin, there are several lines that lack the capacity to convey peak flows produced by the two-year storm event, leading to significant surcharging and modeled overflows. There is significant infiltration and inflow (I/I) in this area, which was selected for the I/I Reduction Demonstration Project (construction began during the fall of 2014). The lines within this area are less than 15-inch diameter, and were included in the model based on flow metering conducted during the I/I Reduction Demonstration Project.
  - In the central portion of Mill Creek, the west branch of two parallel interceptors lacks the capacity to convey peak two-year storm event flows, resulting in significant surcharging in the area between State Avenue and Interstate 70. Flow metering indicates the majority of the flow

in this area is conveyed through the 21-inch diameter west interceptor, while the east interceptor has capacity to convey additional flows.

- Little Turkey Tributary North Basin:
  - One line segment on the 18-inch interceptor was determined to be under capacity for peak flows generated by the two-year storm event, resulting in significant surcharging. However, this resulted in only minor surcharging that did not appear to cause any negative impacts.
- Little Turkey Tributary South and Grinter Creek Basins:
  - The vast majority of flows conveyed to Plant 20 are pumped to the plant from PS 6, which receives flow from the two gravity interceptors carrying all flow from the UG collection system to Plant 20 (additional flow from the neighboring City of Edwardsville is pumped directly to Plant 20). As currently operated, flow from PS 6 is limited to a maximum capacity of approximately 14 mgd due to downstream capacity restrictions at Plant 20. Peak flows to the pump station during the two-year storm event exceed this capacity, resulting in overflow at the pump station.
- Brenner Heights Creek Basin:
  - The upper reaches of the Brenner Heights Creek Basin have large peaking factors due to the amount of I/I entering the system and this area was selected for the I/I Reduction Demonstration Project (construction began during the fall of 2014). There are three diversion pipes in this area that allow flow to leave the system during times of limited capacity.
- Brenner Heights Tributary Basin:
  - The upper reaches of the Brenner Heights Tributary Basin have small pockets of surcharging due to the amount of I/I entering the system. This surcharging occurs downstream of PS 28 and can be alleviated by either upsizing these segments or providing a parallel gravity sewer.
- Barber Creek Basin:
  - PS 18 is an area that experiences surcharging during the two-year storm event. There are two overflows located near PS 18. According to historical data, this pump station experiences several overflows per year. Adjustments to reconfigure the overflow to utilize an existing lagoon as an excess flow holding basin (EFHB) are under construction. The capacity limitations at this pump station are due in large part to the size of the existing force main and the interaction between PS 18 and PS 5, which utilize the same force main. Design has been completed to utilize the existing lagoon at PS 18. This project is scheduled to begin construction in the Fall of 2016. Additional investigation and design of improvements to improve the operation between PS 5 and PS 18 to alleviate overflows will also be performed.
- Little Muncie and Muncie Creek Basins:
  - The Muncie Creek Interceptor sewer is under capacity due to I/I within the Little Muncie, Union Pacific Bottoms and Muncie Creek Basins. This interceptor conveys flow to PS 7. The Muncie Creek Interceptor runs parallel to Kaw Drive and does not have any direct connections; therefore, minor surcharging in this area is not causing any potential backups or overflows.
- Turkey Creek Basin:
  - The hydraulic model indicated the area around PS 12 experiences surcharging when the overflow at the pump station is closed. This surcharging was confirmed with historical data showing emergency overflows at this location. In November 2015, PS 12 was eliminated and replaced with a gravity sewer with adequate capacity to eliminate the modeled surcharging.
- Brush Creek Basin:
  - The Brush Creek Basin has a high peaking factor due to I/I entering the system. The additional flow inundates PS 37 and it cannot convey all the flow. This causes a diversion to the

Kansas City, Missouri (KCMO) combined sewer system. There is an overflow associated with PS 37 that overflows to the KCMO system during high flows.

Modeled overflow locations for the two-year storm event are presented in Table 2-11.

Table 2-11: Modeled SSS Overflow Locations for Two-Year Storm Event (Year 2013)

Manhole Structure ID	Basin
312-057	Mill Creek
312-058	Mill Creek
285-060	Mill Creek
110-143	Mattoon Creek
213-030	Brenner Heights Creek
214-057 (SSO)	Brenner Heights Creek
203-026 (SSO)	Brenner Heights Creek
204-026 (SSO)	Brenner Heights Creek
196-075 (PS 18 Overflow)	Barber Creek
048-038 (PS 40 Overflow)	Argentine
331-008 (PS 6 Overflow)	Little Turkey Tributary South

Flow restrictions within the SSS identified through hydraulic modeling for existing conditions during the five-year storm event are summarized below (refer to Figure 2-12 and Figure 2-13):

- Mill Creek Basin:
  - In the northern portion of the basin, there are several lines that lack the capacity to convey peak flows produced by the five-year storm event, leading to significant surcharging and modeled overflows. The lines within this area are less than 15 inches in diameter, and were included in the model based on flow metering conducted during the I/I Reduction Demonstration Project.
  - In the central portion of Mill Creek, the west branch of two parallel interceptors lacks the capacity to convey peak five-year storm event flows, resulting in significant surcharging and a modeled overflow. Flow metering indicates the majority of the flow in this area is conveyed through the 21-inch diameter west interceptor, while the east interceptor has capacity to convey additional flows.
- Little Turkey Tributary North Basin:
  - A section of the 18-inch diameter interceptor (approximately 2,400 linear feet) was determined to be under capacity for peak flows generated by the five-year storm event, resulting in significant surcharging. This surcharging appears to be confined to an undeveloped area within the basin, and modeling does not indicate this causes any overflows.
- Little Turkey Tributary South and Grinter Creek Basins:
  - The vast majority of flows conveyed to Plant 20 are pumped to the plant from PS 6, which receives flow from the two gravity interceptors carrying all flow from the UG collection system to Plant 20 (additional flow from the neighboring City of Edwardsville is pumped directly to

Plant 20). As currently operated, flow from PS 6 is limited to a maximum capacity of approximately 14 mgd due to downstream capacity restrictions at Plant 20. Peak flows to the pump station during the five-year storm event exceed this capacity, resulting in overflow at the pump station.

- Two interceptors convey flow from the north and east to PS 6. These interceptors converge at the diversion structure upstream of the pump station and both interceptors would have the capacity to carry peak five-year storm event flow for existing conditions if there were no downstream restrictions. However, capacity restrictions within the pump station cause significant surcharging to occur on both of the interceptors. This surcharging is located within an undeveloped area and there are no connections within the lines that surcharge. However, the model indicates that overflows occur on the east interceptor during the five-year storm event.

- Island Creek Basin:
  - PS 16 has insufficient pumping capacity to convey peak flow during the five-year storm event. However, there is an EFHB located at PS 16 allowing peak wet weather flows to be stored within the basin during the storm event. When the storm event subsides, these flows are drained back to the pump station.
- Brenner Heights Tributary Basin:
  - The upper reaches of the Brenner Heights Tributary Basin have small pockets of surcharging due to the amount of I/I entering the system. This surcharging occurs downstream of PS 28 and can be alleviated by either upsizing these segments or providing a parallel gravity sewer.
- Brenner Heights Creek Basin:
  - The upper reaches of the Brenner Heights Creek Basin has large peaking factors due to the amount of I/I entering the system. Three diversion pipes in this area allow flow to leave the system during times of limited capacity.
- Barber Creek Basin:
  - PS 18 is an area that experiences surcharging during the five-year storm event. There are two overflows located near PS 18. According to historical data, this pump station experiences several overflows per year. Adjustments to reconfigure the overflow to utilize an existing lagoon as an EFHB are under construction. The capacity limitations at this pump station are due in large part to the size of the existing force main and the interaction between PS 18 and PS 5, which utilize the same force main. The design has been completed to utilize the existing lagoon at PS 18. This project is scheduled to begin construction in the Fall of 2016. Additional investigation and design of improvements to improve the operation between PS 5 and PS 18 to alleviate overflows will also be performed.
- Little Muncie and Muncie Creek Basins:
  - The Muncie Creek Interceptor sewer is under capacity due to I/I within the Little Muncie, Union Pacific Bottoms and Muncie Creek Basins. This interceptor conveys flow to PS 7. The Muncie Creek Interceptor runs parallel to Kaw Drive and does not have any direct connections; therefore, minor surcharging in this area is not causing any potential backups or overflows.
- Turkey Creek Basin:
  - The hydraulic model indicated the area around PS 12 experiences surcharging when the overflow at the pump station is closed. This surcharging is confirmed with historical data showing emergency overflows at this location. In November 2015, PS 12 was eliminated and replaced with a gravity sewer with adequate capacity to eliminate the modeled surcharging.

- Brush Creek Basin:
  - The Brush Creek Basin has a high peaking factor due to I/I entering the system. The additional flow inundates PS 37 and it cannot convey all the flow. This causes a diversion to the KCMO sewer system. There is an overflow upstream of PS 37 that sends flow to the KCMO combined sewer system during high flows.
- Turner Creek and Argentine Basins:
  - During the five-year storm event, there is minor surcharging in the Turner Creek Basin near PS 22. In addition, there is some surcharging along the interceptor sewer that conveys flow from the Barber Creek and Turner Creek Basins into the Argentine and Armourdale Basins.

Modeled overflow locations for the five-year storm event are presented in Table 2-12.

Table 2-12: Modeled SSS Overflow Locations for Five-Year Storm Event (Year 2013)

Manhole Structure ID	Location
295-002-MH	Grinter Creek
302-003-MH	Grinter Creek
272-039-MH	Mill Creek
285-060-MH	Mill Creek
286-031-MH	Mill Creek
289-053-MH	Mill Creek
289-062-MH	Mill Creek
312-057-MH	Mill Creek
312-058-MH	Mill Creek
331-008 (PS 6 Overflow)	Little Turkey Tributary South
048-040 (PS 40 Overflow)	Argentine
196-075 (PS 18 Overflow)	Barber Creek
213-030	Brenner Heights Creek
214-057 (SSO)	Brenner Heights Creek
203-026 (SSO)	Brenner Heights Creek
204-026 (SSO)	Brenner Heights Creek
199-003	Brenner Heights Creek
199-005	Brenner Heights Creek
199-006	Brenner Heights Creek
199-009	Brenner Heights Creek
199-011	Brenner Heights Creek
199-012	Brenner Heights Creek
199-023	Brenner Heights Creek
199-048	Brenner Heights Creek

Manhole Structure ID	Location
200-071	Brenner Heights Creek
214-072	Brenner Heights Creek
142-051	Brenner Heights Tributary
142-067	Brenner Heights Tributary
142-068	Brenner Heights Tributary
142-069	Brenner Heights Tributary
142-093	Brenner Heights Tributary
165-001	Brenner Heights Tributary
166-046	Brenner Heights Tributary
166-073	Brenner Heights Tributary
179-009	Brenner Heights Tributary
180-006	Brenner Heights Tributary
180-007	Brenner Heights Tributary
180-056	Brenner Heights Tributary
180-065	Brenner Heights Tributary
200-069	Brenner Heights Tributary
200-070	Brenner Heights Tributary
147-006	Indian Creek
110-143	Mattoon Creek
110-132	Mattoon Creek
185-055	Turner Creek

2.2.6.2 Future Gravity Collection System Capacity Analysis

The 20-year planning period (Year 2033) conditions flow projections include projected dry and wet weather flows contributed by anticipated future growth within the SSS. Population projections for Year 2033 were initially calculated from the Year 2030 and Year 2040 population projections prepared by the UG Research Division and the Mid-America Regional Council (MARC). The Year 2033 populations were calculated by interpolating between the Year 2030 and 2040 populations. In the event that the population for a basin decreased from 2013 to 2033, the higher Year 2013 population was used for the future conditions analysis.

It was determined that substantial future growth is anticipated to occur within the SSS basins, primarily in the western portion of UG’s service area within the basins tributary to Plant 20 and the Wolcott WWTP. This growth is projected to have significant impacts on the existing wastewater system and the corresponding improvements that will be required to accommodate the projected growth. Therefore, it was decided that a more detailed evaluation of the impacts of projected future growth was required.

A *SSS Wastewater Master Plan* was prepared to evaluate improvement alternatives and develop a 20-year capital improvement plan for the basins tributary to Plant 20 and the Wolcott WWTP. The population projections provided by MARC were evaluated in greater detail with a particular emphasis on identifying the locations within the collection system where growth is anticipated to occur. Projections of future growth anticipated to occur within the 20-year planning period were developed in close coordination with the UG Urban Planning and Land Use Department, who provided the anticipated locations, size, and characteristics of developments anticipated to occur by 2033. Staff from the neighboring cities of Edwardsville and Bonner Springs provided additional information on the characteristics of anticipated future developments within the adjacent communities that may affect UG's system. Despite the appropriate methodology used to develop the population projections, the population projects seem optimistic compared to historical population growth.

The projected future flows contributed by these developments were estimated based on the flow criteria documented in the *SSE Work Plan*. The hydraulic model analysis of the future (Year 2033) conditions assumes full build-out and occupancy of all of the potential developments identified. Based on these assumptions, the future modeled conditions represent a conservative analysis of potential future conditions based upon UG and MARC's best growth estimates.

The primary focus of this analysis was to identify the potential future flow restrictions that may impact the selection and sizing of the appropriate alternative(s) to address both existing and potential future capacity issues within the service area. The results of the analysis were used to support the development of the IOCP and are summarized below.

2.2.6.2.1 Basins Tributary to Plant 20 and Wolcott WWTP

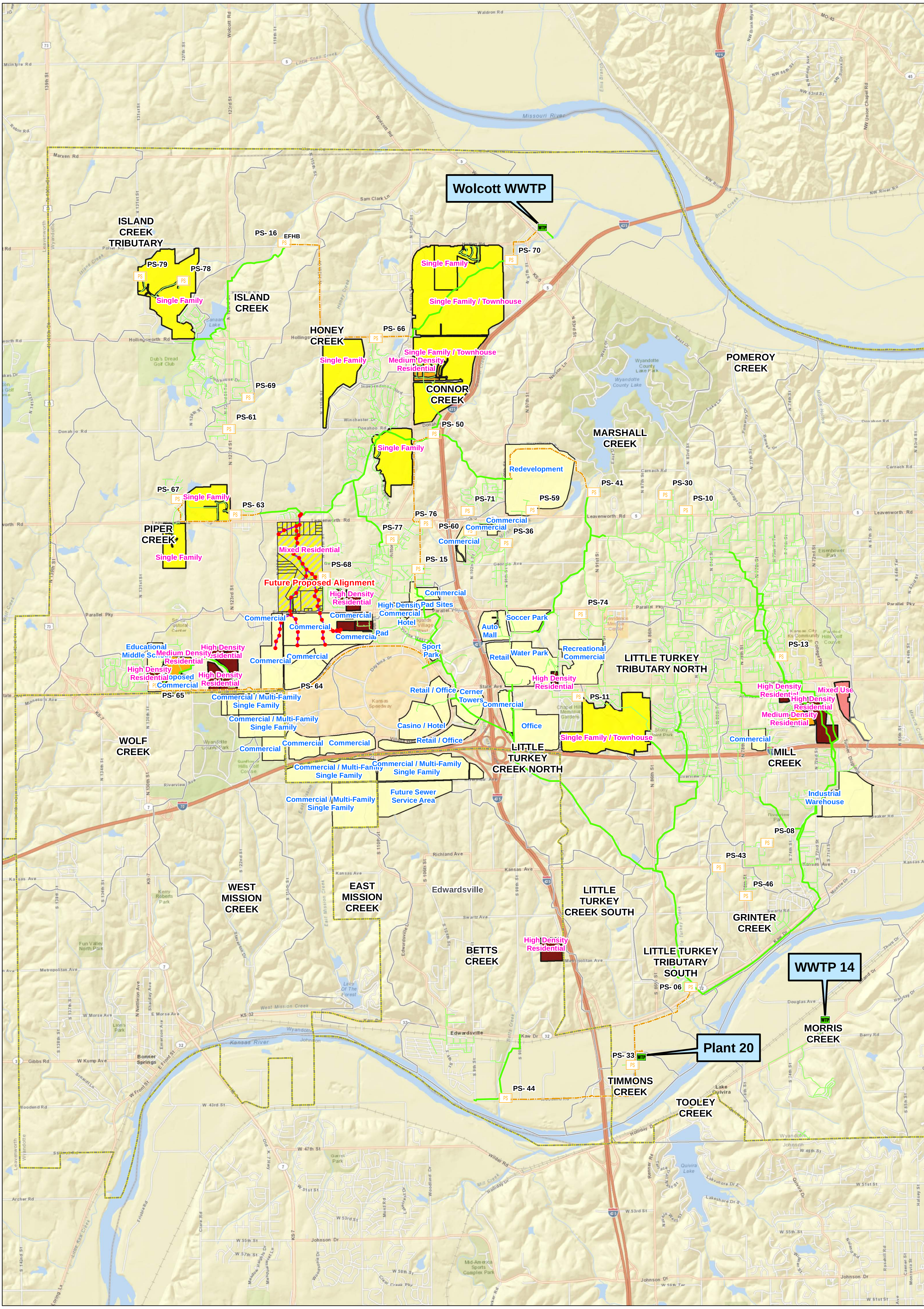
The current and projected sewered populations for existing and Year 2033 conditions in the western SSS basins, as well as the projected non-residential development area, are provided in Table 2-13. The anticipated locations and land uses for the future developments are shown on Figure 2-14.

Table 2-13: Population and Sewered Area Growth Projections for Basins Tributary to Plant 20 and Wolcott WWTP

Basin	Sewered Population (capita)			Developed and Sewered Area (acres)			
	Year 2013	Population Growth	Year 2033	Year 2013	Residential Growth	Non-Residential Growth	Year 2033
Connor Creek	4,840	15,390	20,230	2,644	1,433	339	4,416
East Mission Creek	0	0	0	0	0	196	196
Grinter Creek	1,770	0	1,770	806	0	0	806
Honey Creek	210	1,410	1,620	104	169	0	273
Island Creek	1,350	0	1,350	719	0	0	719
Island Creek Tributary	80	2,600	2,680	278	266	0	544
Little Turkey Creek North	1,070	2,870	3,940	937	180	609	1,726
Little Turkey Creek South	0	0	0	0	0	0	0
Little Turkey Creek Tributary North	4,949	1,660	6,609	110	125	25	260
Little Turkey Creek Tributary South	0	0	0	1,559	0	0	1,559
Marshall Creek	2,030	630	2,660	1,263	7	682	1,952
Mill Creek	12,020	3,800	15,820	2,718	126	108	2,952
Morris Creek	820	0	820	396	0	0	396
Piper Creek	310	1,830	2,140	205	192	1	398
Pomeroy Creek	0	0	0	0	0	0	0
Timmons Creek	0	0	0	0	0	0	0
Tooley Creek	0	0	0	0	0	0	0
Wolf Creek	820	4,360	5,180	225	159	100	484
UG Total	30,269	34,550	64,819	11,964	2,657	2,060	16,681

Basin	Sewered Population (capita)			Developed and Sewered Area (acres)			
	Year 2013	Population Growth	Year 2033	Year 2013	Residential Growth	Non-Residential Growth	Year 2033
Bonner Springs (Only Area Served by UG)							
Wolf Creek and West Mission Creek	0	6,119	6,119	0	222	138	360
Edwardsville - Betts Creek							
To UG Collection System for Conveyance	0	5,384	5,384	0	140	327	467
To Plant 20 Via PS 44	NA[1]	1,275	NA[1]	0[1]	37	0	NA[1]

Notes:
1. Existing sewered population and area in Edwardsville were not estimated.



Legend

- Basin Boundary
- City Boundary
- PS Pump Stations
- WTP Treatment Plant
- UG Existing Force Main
- UG Existing Model Pipe
- UG Gravity Main
- Commercial
- High Density Residential
- Low Density Residential
- Mixed Use Residential
- Medium Density
- Mixed Use
- Rural Density Residential

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

N

0 1 2 Miles

Data Sources: HDR Inc, ESRI
Coordinate System: NAD_1983_StatePlane_Kansas_North_FIPS_1501

Figure 2-14

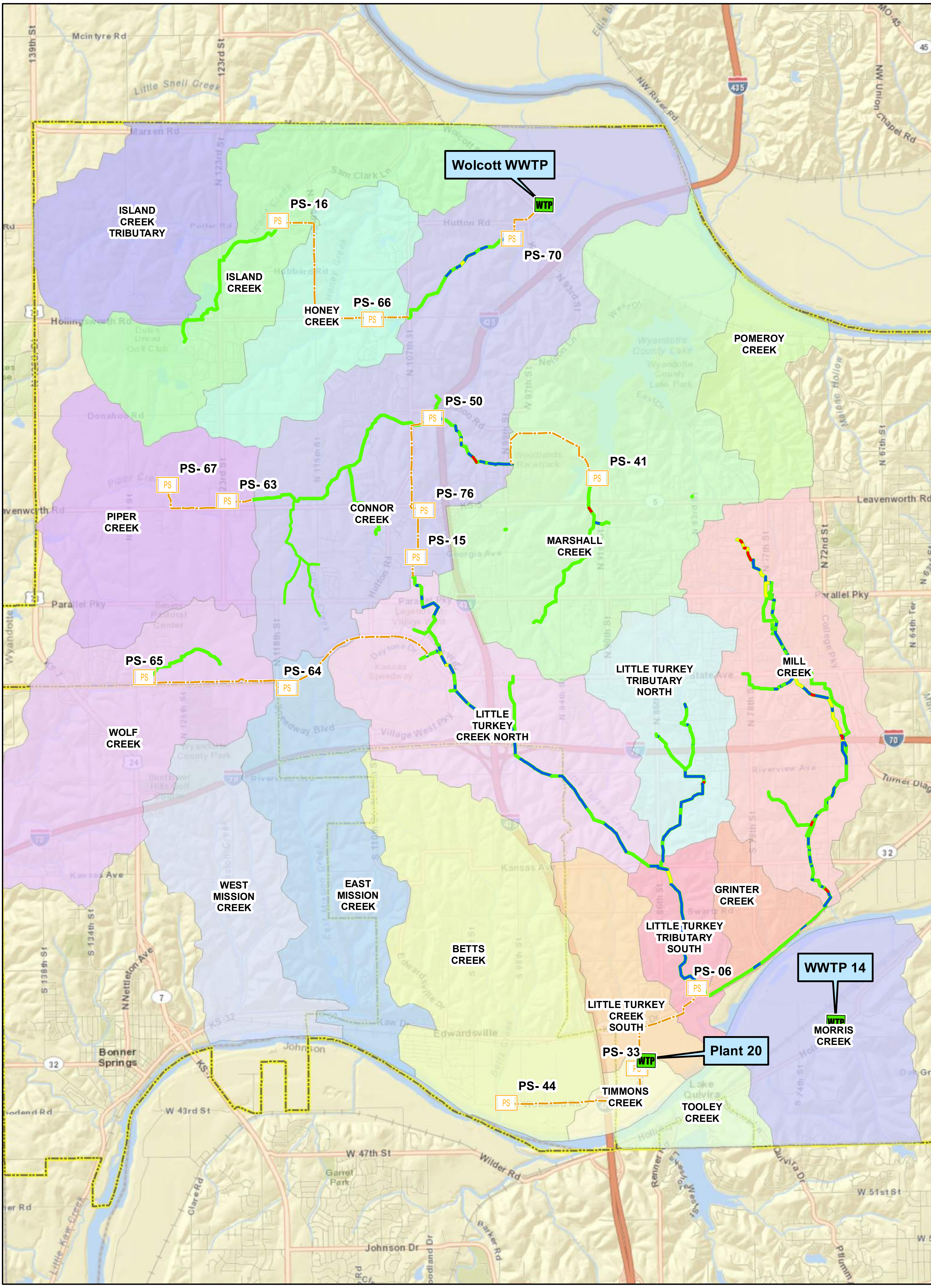
Projected Future Developments (Year 2033)

Using the aforementioned projections, approximately 9% of the overall length of the modeled sewer system was identified to be under capacity for the two-year storm event for Year 2033 conditions as shown in Table 2-14 and on Figure 2-15, compared to approximately 4% for existing conditions. Approximately 16% of the overall length of the modeled system was identified to be under capacity for the five-year storm event for 2033 conditions as shown in Table 2-14 and on Figure 2-16, compared to approximately 9% for existing conditions.

Table 2-14: Sewer Capacity Utilization for Two- and Five-Year Storm Events, Basins Tributary to Plant 20 and Wolcott WWTP (Year 2033)

Metric	Two-Year Storm Event	Five-Year Storm Event
Total Length of System Modeled[1]	206,962 ft	206,962 ft
<50% Capacity Utilization	133,669 ft (65%)	91,539 ft (44%)
50 to 100% Capacity Utilization	56,461 ft (27%)	81,816 ft (40%)
100 to 150% Capacity Utilization	11,494 ft (6%)	27,468 ft (13%)
>150% Capacity Utilization	5,339 ft (3%)	6,140 ft (3%)
Length of Modeled System in Surcharge	16,833 ft (8%)	33,608 ft (16%)

Note:
1. Future conditions model includes lines that were constructed after existing conditions flow metering and modeling was completed. These were included in the model in order to more accurately model flow from future growth.



Legend

- City Boundary
- Basin Boundary
- Pump Stations
- Treatment Plant
- UG Existing Force Main

Sewer Capacity Utilization Modeled Lines

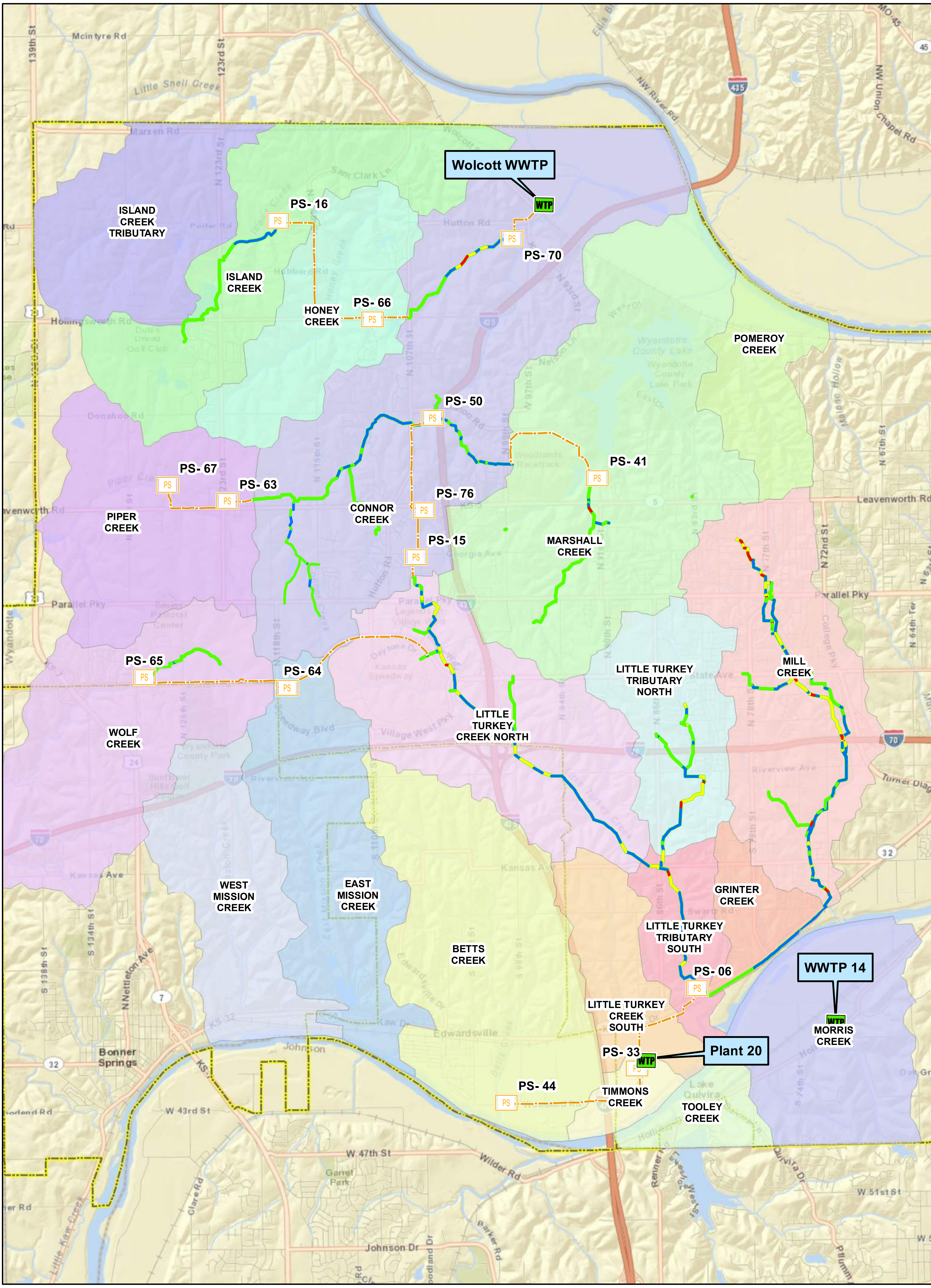
- < 50%
- 50-100%
- 100-150%
- > 150%

0 1 2 Miles

Data Sources: HDR Inc, ESRI
Coordinate System: NAD_1983_StatePlane_Kansas_North_FIPS_1501

Figure 2-15

Capacity Analysis for Two-Year Storm Event for Basins Tributary to Plant 20 and Wolcott WWTP (Year 2033)



Legend

- City Boundary
- Basin Boundary
- PS Pump Stations
- WTP Treatment Plant
- UG Existing Force Main

Sewer Capacity Utilization Modeled Lines

- < 50%
- 50-100%
- 100-150%
- > 150%

0 1 2 Miles

Data Sources: HDR Inc, ESRI
Coordinate System: NAD_1983_StatePlane_Kansas_North_FIPS_1501

Figure 2-16

Capacity Analysis for Five-Year Storm Event for Basins Tributary to Plant 20 and Wolcott WWTP (Year 2033)

Potential future flow restrictions within basins tributary to Plant 20 and the Wolcott WWTP were identified through hydraulic modeling for Year 2033 conditions during two-year and five-year storm events. Refer to the *SSS Characterization Report* for a detailed evaluation of the identified flow restrictions.

2.2.6.2.2 Basins Tributary to Kaw Point WWTP

The current and projected sewered populations for existing and Year 2033 conditions in the eastern SSS basins, as well as the projected non-residential development area, are provided in Table 2-15.

Table 2-15: Population Growth Projections for Basins Tributary to Kaw Point WWTP

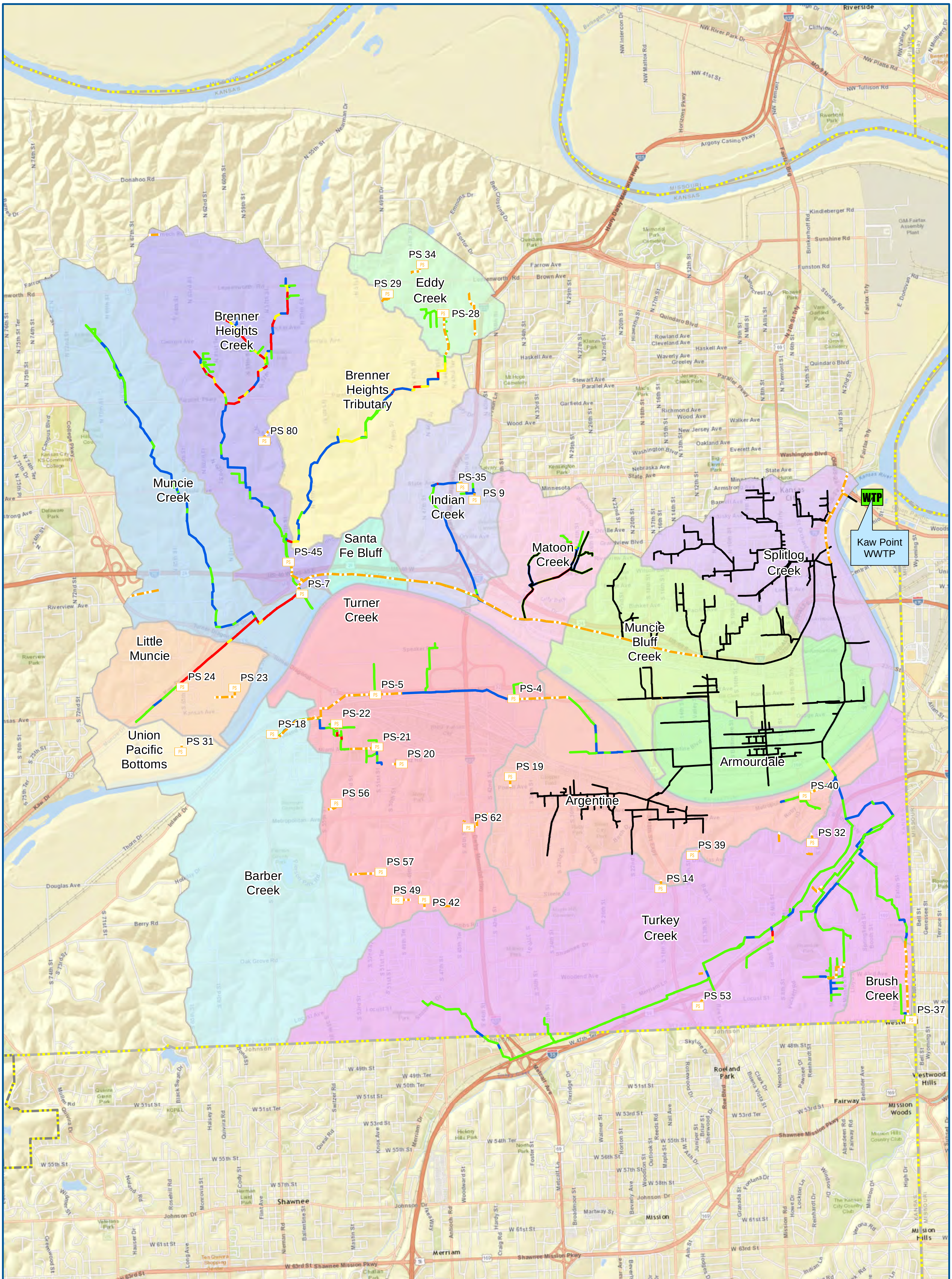
Basin	Sewered Population (capita)	
	Year 2013	Year 2033
Barber Creek	1,179	1,179
Brenner Heights Creek	7,787	7,845
Brenner Heights Tributary	5,676	5,727
Brush Creek	1,719	1,782
Eddy Creek	721	731
Indian Creek	2,413	2,472
Little Muncie	522	522
Mattoon Creek	2,633	2,870
Muncie Creek	4,371	4,419
Santa Fe Bluff	0	0
Turkey Creek	17,698	17,849
Turner Creek	2,865	2,866
Union Pacific Bottoms	225	225
Total	47,809	48,487

Due to the limited growth in the basins tributary to the Kaw Point WWTP, there was no significant increase in surcharge and pipe capacity utilization for Year 2033 conditions as indicated in Table 2-16 and on Figure 2-17 and Figure 2-18.

Table 2-16: Sewer Capacity Utilization for Two- and Five-Year Storm Events, Basins Tributary to Kaw Point WWTP (Year 2033)

Metric	Two-Year Storm Event	Five-Year Storm Event
Total Length of System Modeled	274,782 ft	274,782 ft
<50% Capacity Utilization	175,036 ft (64%)	125,301 ft (46%)
50-100% Capacity Utilization	53,583 ft (20%)	68,970 ft (25%)
100-150% Capacity Utilization	14,289 ft (5%)	28,577 ft (10%)
>150% Capacity Utilization	30,776 ft (11%)	51,110 ft (19%)
Length of Modeled System in Surcharge[1]	108,539 ft (40%)	154,428 ft (56%)

Notes:
1 Total length of surcharge also includes length of pipe surcharged due to backwater conditions.



Legend

- City Boundary
- Basin Boundary
- Pump Stations
- Treatment Plant
- UG Existing Force Main
- CSS Modeled Pipes

Sewer Capacity Utilization

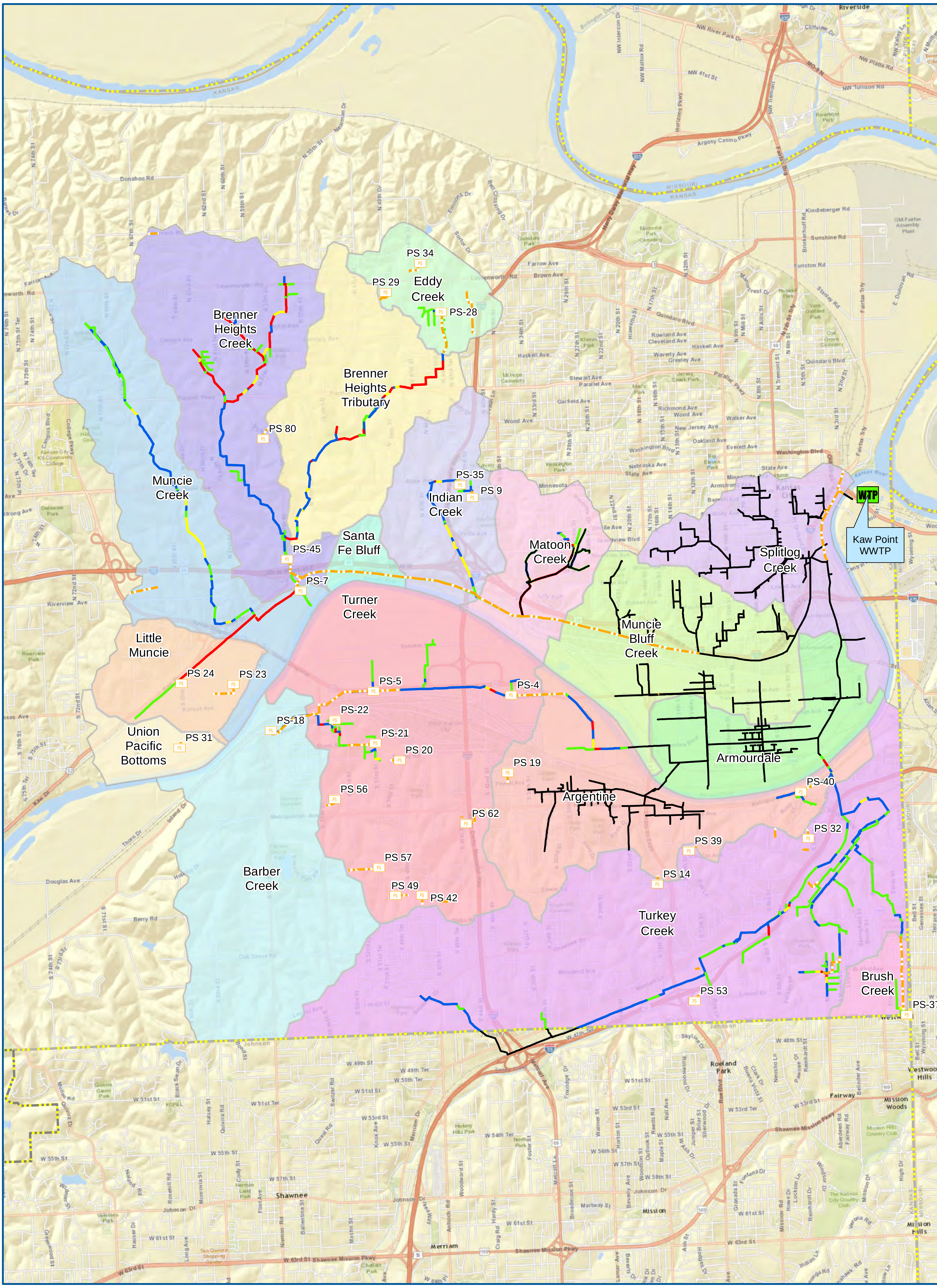
- <50%
- 50% - 100%
- 100% - 150%
- >150%

0 1 2 Miles

Data Sources: B&V, ESRI
Coordinate System: NAD_1983_StatePlane_Kansas_North_FIPS_1501

Figure 2-17

Capacity Analysis for Two-Year Storm Event for Basins Tributary to Kaw Point WWTP (Year 2033)



Legend

- City Boundary
- Basin Boundary
- Pump Stations
- WTP Treatment Plant
- UG Existing Force Main
- CSS Modeled Pipes

Sewer Capacity Utilization

- <50%
- 50% - 100%
- 100% - 150%
- >150%

0 1 2 Miles

Data Sources: B&V, ESRI
Coordinate System: NAD_1983_StatePlane_Kansas_North_FIPS_1501

Figure 2-18

Capacity Analysis for Five-Year Storm Event for Basins Tributary to Kaw Point WWTP (Year 2033)

2.2.6.3 Pump Station Capacity Analysis

A pump station and force main capacity analysis was performed utilizing the hydraulic model to determine the facilities that should be considered for capacity enhancements. Pump stations with modeled peak flows greater than the firm capacity of the pump station and force mains where the peak velocity exceeded 6 feet per second (fps) were identified. Velocities exceeding 6 fps often result in increased friction losses that can negatively impact pump performance. Higher force main velocities may indicate capacity restraints due to force main sizing.

Table 2-17 and Table 2-18 summarize the pump station and force main capacity analysis for two-year and five-year storm events under existing conditions (Year 2013) for modeled pump stations. The design firm capacity listed in these tables is based on the pump nameplate capacities. In some locations, the actual capacity of the station may be lower due to capacity restrictions in the discharge force mains. These restrictions were taken into account in the hydraulic model.

Table 2-17: Pump Station and Force Main Analysis for Two-Year Storm Event (Year 2013)

Pump Station ID	Rated Capacity (mgd)	Design Firm Capacity (mgd)	Force Main Diameter (in)	Force Main Length (ft)	Peak Flow Into Station (mgd)[1]	Peak Force Main Flow (mgd)	Force Main Peak Velocity (fps)[2]	Insufficient Capacity Causing Overflow
4	9.5	4.5	16	2,770	4.2	4.5	5.0	-
5	3.5	1.8	12	25	0.9	1.0	2.0	-
5/18 joined[3]	NA	NA	12	1,252	NA	2.7	5.4	YES
6	20.2	14.0[4]	30	5,850	20.3	14.0	4.4	YES
7	8.7	6.2	30	18,400	8.8	8.4	2.6	YES
16	1.2	0.6	6	12,690	0.8	0.6	4.7	NO[5]
18	4.2	2.9	10	10,500	1.8	1.8	5.2	-
21	1.0	0.5	6	1,350	0.8	0.9	7.0	-
22	0.3	0.1	4	380	0.2	0.20	3.5	-
28	0.6	0.3	6	2,100	0.4	0.6	4.8	-
35	0.6	0.3	4	525	0.4	0.3	5.2	-
37	1.7	0.9	10	3,950	3.9	3.4	9.8	YES
40	1.3	0.6	10	1,160	1.8	1.9	5.2	NO
41	7.8	5.8	8 & 12	15,400	2.0	2.9	5.7	-
45	4.5	1.9	18	1,350	10.2	7.6	6.6	YES[6]
50	13.4	8.9	20	10,100	4.5	6.9	4.9	-
63	0.4	0.2	4	1,400	0.3	0.3	5.9	NO
64	5.8	3.9	14	9,300	2.4	2.6	3.8	
65	5.7	3.8	14	10,150	0.6	2.4	3.5	-

Pump Station ID	Rated Capacity (mgd)	Design Firm Capacity (mgd)	Force Main Diameter (in)	Force Main Length (ft)	Peak Flow Into Station (mgd)[1]	Peak Force Main Flow (mgd)	Force Main Peak Velocity (fps)[2]	Insufficient Capacity Causing Overflow
67	1.0	0.5	6	3,400	0.3	0.6	4.4	-
70	1.7	0.9	8	3,120	0.9	0.9	4.0	-

Notes:

1. Blue cells indicate projected peak flows exceed rated capacity; yellow cells indicate projected peak flows exceed design firm capacity.
2. Blue cells indicate projected peak force main velocities exceed 12 fps; yellow cells indicate projected peak force main velocities exceed 6 fps.
3. Section of force main downstream of where PS 5 force main tees into PS 18 force main. Connection of force main reduces PS 18 pumping capacity and causes overflows to excess flow holding basin at PS 18.
4. Pump station limited to 14 mgd maximum due to restrictions in peak flow capacity at Plant 20.
5. Excess flow is diverted to excess flow holding basin for storage during design storm events.
6. PS 45 overflows to gravity sewer, which is then conveyed to PS 7.

Table 2-18: Pump Station and Force Main Analysis for Five-Year Storm Event (Year 2013)

Pump Station ID	Rated Capacity (mgd)	Design Firm Capacity (mgd)	Force Main Diameter (in)	Force Main Length (ft)	Peak Flow Into Station (mgd)[1]	Peak Force Main Flow (mgd)	Force Main Peak Velocity (fps)[2]	Insufficient Capacity Causing Overflow
4	9.5	4.5	16	2,770	6.9	6.9	7.6	-
5	3.5	1.8	12	25	1.3	1.8	3.5	-
5/18 joined[3]	NA	NA	12	1,252	NA	4.3	8.4	YES
6	20.2	14.0[4]	30	5,850	29.2	14.0	4.4	YES
7	8.7	6.2	30	18,400	13.690	14.1	4.4	YES
16	1.2	0.6	6	12,690	1.58	0.60	4.7	NO[5]
18	4.2	2.9	10	10,500	3.2	3.1	8.9	-
21	1.0	0.5	6	1,350	1.2	1.2	9.6	YES
22	0.3	0.1	4	380	0.2	0.2	3.5	-
28	0.6	0.3	6	2,100	0.9	1.1	8.8	YES
35	0.6	0.3	4	525	0.5	0.3	5.6	-
37	1.7	0.9	10	3,950	7.2	6.880	19.5	YES
40	1.3	0.6	10	1,160	2.9	2.9	8.3	YES
41	7.8	5.8	8 & 12	15,400	2.8	2.9	5.7	-
45	4.5	1.9	18	1,350	17.6	10.0	8.8	YES[6]
50	13.4	8.9	20	10,100	6.7	8.0	5.7	-
63	0.4	0.2	4	1,400	0.4	0.3	5.9	NO
64	5.8	3.9	14	9,300	2.4	2.6	3.8	
65	5.7	3.8	14	10,150	0.8	2.4	3.5	-

Pump Station ID	Rated Capacity (mgd)	Design Firm Capacity (mgd)	Force Main Diameter (in)	Force Main Length (ft)	Peak Flow Into Station (mgd)[1]	Peak Force Main Flow (mgd)	Force Main Peak Velocity (fps)[2]	Insufficient Capacity Causing Overflow
67	1.0	0.5	6	3,400	0.3	0.6	4.4	-
70	1.7	0.9	8	3,120	1.1	0.9	4.0	-

Notes:
1. Blue cells indicate projected peak flows exceed rated capacity; yellow cells indicate projected peak flows exceed design firm capacity.
2. Blue cells indicate projected peak force main velocities exceed 12 fps; yellow cells indicate projected peak force main velocities exceed 6 fps.
3. Section of force main downstream of where PS 5 force main tees into PS 18 force main. Connection of force main reduces PS 18 pumping capacity and causes overflows to excess flow holding basin at PS 18.
4. Pump station limited to 14 mgd maximum due to restrictions in peak flow capacity at Plant 20.
5. Excess flow is diverted to excess flow holding basin for storage during design storm events.
6. PS 45 overflows to gravity sewer, which is then conveyed to PS 7.

During a two-year storm event for existing conditions, peak flow into the pump station exceeds the pump station capacity at 10 pump stations. This occurs at 14 pump stations for the five-year storm event. Similarly, the force main peak velocity exceeds 6 fps at three and eight locations for the two- and five-year storm events, respectively.

2.2.6.4 Non-Modeled System Analysis

A non-modeled sewershed analysis focused on specific areas of interest within the SSS basins that were not evaluated through hydraulic modeling. These specific areas included areas with historical surcharging and pump stations and WWTPs that were not included in the hydraulic model.

The results of the flow monitoring analysis were used in the non-modeled system capacity analysis to aid in projecting peak flows. Flow characteristics for meter catchments determined during the flow monitoring analysis, such as peaking factors, infiltration, and inflow rates, were used to project non-modeled flows for facilities located within these meter catchments. Projected total peak flows were determined by summing the base flow, wet weather infiltration, and peak inflow projected for the two-year and five-year storm events.

The results of the capacity analysis performed for the non-modeled pump stations comparing the peak two-year and five-year projected Year 2033 flow rates to the pump station firm capacity is shown in Table 2-19.

Table 2-19: Non-Modeled Pump Station Analysis Results

Pump Station ID	Design Firm Capacity[1] (gpm)	Tested Firm Capacity[2] (gpm)	Two-Year Peak Flow[3] (gpm)	Five-Year Peak Flow[3] (gpm)	Overflow
Pump Stations Tributary to Plant 20					
8[4]	11	Not tested	36	43	Yes
10[5]	125	100	317	377	Yes (to EFHB)
11	80	54	103	121	Yes
13	150	161	43	50	-
30	100	68	112	133	Yes
36	500	506	333	382	-
43	100	134	31	38	-
46	160	Not tested	84	102	-
60	200	176	77	87	-
74	80	86	31	37	-
Pump Stations Tributary to Wolcott WWTP					
61[6]	150	139	250	300	-
69	200	244	57	64	-
78	200	354	40	47	-
79[4]	11.5	Not tested	16	20	-
Pump Stations Tributary to CSS and Kaw Point WWTP					
9[7]	100	0	5	6	-
14	160	101	116	143	-
19	150	170	240	300	-
20	200	174	138	175	-
23	100	Not tested	258	296	-
24	350	329	894	1,022	-
25	120	205	415	523	
26	103	Not tested	244	309	Yes
27	200	189	272	343	Yes
29	100	113	221	277	-
31	580	542	358	401	-
32	100	77	81	98	-
34	100	98	50	63	-
39	75	113	12	15	-
42	210	178	185	233	-
49	100	82	59	75	-

Pump Station ID	Design Firm Capacity[1] (gpm)	Tested Firm Capacity[2] (gpm)	Two-Year Peak Flow[3] (gpm)	Five-Year Peak Flow[3] (gpm)	Overflow
53	90	85	38	47	-
55	150	114	168	206	
56	165	197	36	42	-
57	340[8]	95	186	237	-
62	200	168	603	737	-
80	100	Not tested	74	93	-

Notes:

1. Total nameplate capacity of individual pumps with the largest pump out of service.
2. Total tested capacity of individual pumps with the largest pump out of service.
3. Blue cells indicate projected peak flows exceed firm capacity.
4. Grinder pump station. Capacity is adequate for existing conditions. There is the potential for new homes to be constructed within its service area; however, construction would likely be challenging. If additional home development occurs, flows and station performance should be evaluated to ensure the pump station has adequate capacity.
5. Overflows to an EFHB.
6. Capacity issues at PS 61 were identified by UG staff after the *SSS Characterization Report* was submitted. Peak wet weather flow projections are believed to be greater than those listed in the *SSS Characterization Report* and have been revised in the above table.
7. Pump Station 9 has only one pump; therefore, firm capacity is zero. This pump station serves a single unoccupied building. This building is currently being investigated. Pending the results of the investigation, this pump station may be eliminated.
8. Pump tests indicated that the pumps are performing well below the design capacity; therefore, the pump station does not have adequate capacity for the peak flows.

2.2.6.5 Wastewater Treatment Plant Capacity Analysis

The purposes of the WWTP capacity evaluations were to evaluate existing plant hydraulic and process loadings, identify unit processes where excess capacity or hydraulic deficiencies exist, and recommend improvements to remove hydraulic deficiencies and improve hydraulic capacity.

2.2.6.5.1 Plant 20

PS 6 conveys flow to Plant 20 thru 5,850 feet of 30-inch diameter force main. This pump station contains three submersible pumps with a total firm capacity of 21 mgd. In addition, PS 44 conveys flow to Plant 20 thru approximately 12,000 feet of 12-inch diameter force main.

Figure 2-19 presents the Plant 20 process flow diagram. Return activated sludge (RAS) has been included in this evaluation due to the process and hydraulic loadings attributed to RAS. However, for the purposes of this evaluation, the plant's solids stream was not evaluated. Figure 2-20 shows the locations of major unit process facilities.

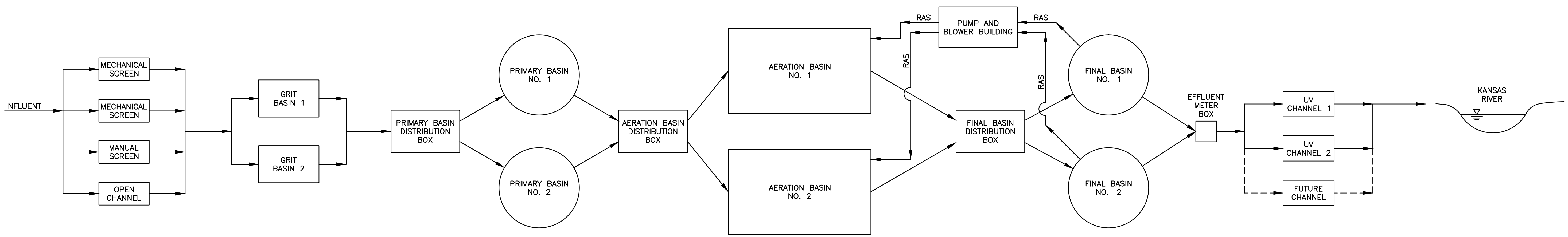


Figure 2-19

Plant 20 Process Flow Diagram

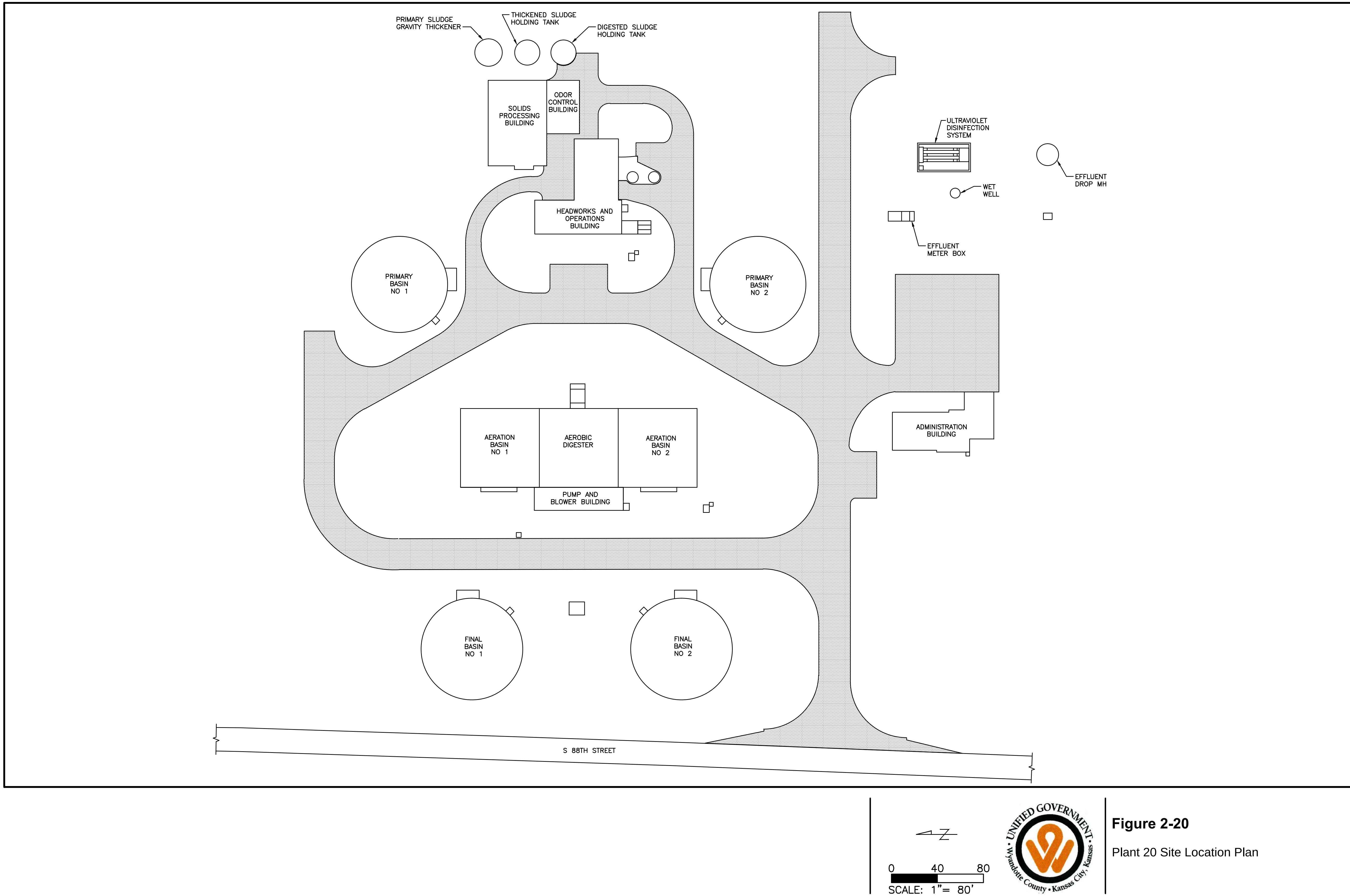


Figure 2-20

Plant 20 Site Location Plan

Historical plant drawings, operation and maintenance manuals, and equipment vendor information were used to evaluate the capacity of existing Plant 20 piping and equipment. Hydraulic profiles for the future projected 7 mgd average flow, 14 mgd peak flow, 17.5 mgd peak flow, and 21 mgd peak flow were completed. Refer to the *SSS Characterization Report* for details of the capacity analysis and evaluation of the existing constraints identified at Plant 20. Refer to Section 6.0 of this IOCP for recommended improvements to address the existing hydraulic constraints.

The capacity evaluation identified no capacity constraints at the 7 mgd design flow of the WWTP. Minor capacity restraints exist at Plant 20 for 14 mgd peak flow (2:1 plant throughout). Major capacity restraints were identified for a 21 mgd peak flow (3:1 throughput), which limit Plant 20's existing hydraulic capacity to a maximum of 14 mgd. These constraints limit the maximum flow that can be pumped to Plant 20 from PS 6, contributing to SSO discharges through the overflow at PS 6.

Flow projections developed as part of the future conditions capacity analysis indicate that future flows to Plant 20 will exceed the facility's design treatment capacity in the current configuration. The projected Year 2033 average daily flow (ADF) to Plant 20 and the Wolcott WWTP are presented in Table 2-20. Refer to Section 6.0 for recommended improvements to address treatment capacity.

Table 2-20: Projected Average Daily Flows to Plant 20 and Wolcott WWTP for Existing (Year 2013) and Future (Year 2033) Conditions

Service Area	Existing Conditions (Year 2013)		Future Conditions (Year 2033)	
	Design Capacity (mgd)	Average Daily Flow (mgd)	With Collection System in Current Configuration (mgd)[1]	With PS 50 Flow Rerouted to Wolcott WWTP (mgd)[2]
ADF from UG System (mgd)	-	3.93	8.28	6.03
ADF from Edwardsville (mgd)[3]	-	0.22	0.35	0.35
Plant 20 ADF (mgd)	7	4.15	8.63	6.38
Wolcott WWTP ADF (mgd)	0.28	0.21	1.39	3.64
Total ADF for Plant 20 and Wolcott WWTP Service Areas (mgd)	7.28	4.36	10.02	10.02

Notes:
1. The portion of Plant 20's service area that drains to Pump Station 50 would naturally drain north to the Wolcott WWTP service area. This flow is currently pumped south to Plant 20's service area and conveyed to Plant 20 for treatment.
2. Under this scenario, Pump Station 50 would be decommissioned. The Lower Connor Creek Interceptor would be constructed to convey flow by gravity from Pump Station 50 to an expanded Wolcott WWTP.
3. Flow from the neighboring City of Edwardsville is pumped directly to Plant 20 for treatment.

2.2.6.5.2 Wolcott WWTP

The Wolcott WWTP discharges to the Missouri River via Connor Creek. The plant permit identifies a 0.288 mgd design average daily flow.

PS 16 conveys flow from the Island Creek and Island Creek Tributary Basins to Connor Creek through about 13,000 feet of 6-inch diameter force main. Flows are then conveyed by gravity to PS 70. PS 70 conveys flow directly to the Wolcott WWTP through approximately 3,000 feet of 8-inch diameter force main. This pump station contains two submersible pumps with a total firm capacity of 0.864 mgd.

Figure 2-21 presents the Wolcott WWTP process flow diagram. RAS has been included in this evaluation due to the process and hydraulic loadings attributed to RAS. However, for the purposes of this evaluation, the plant's solid stream was not evaluated. Figure 2-22 shows the WWTP liquid process lines including force mains, process influent and effluent lines, and RAS lines.

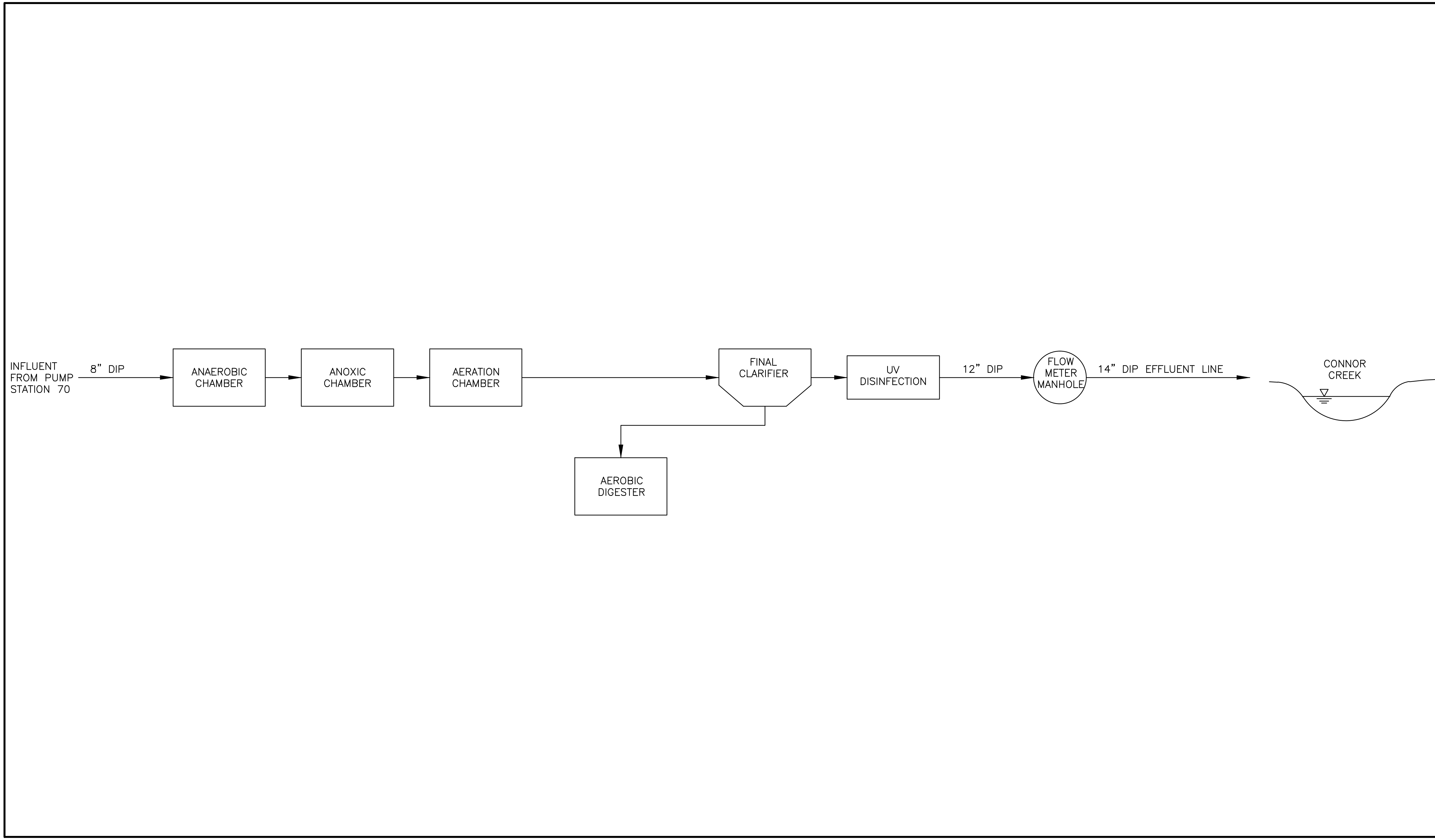
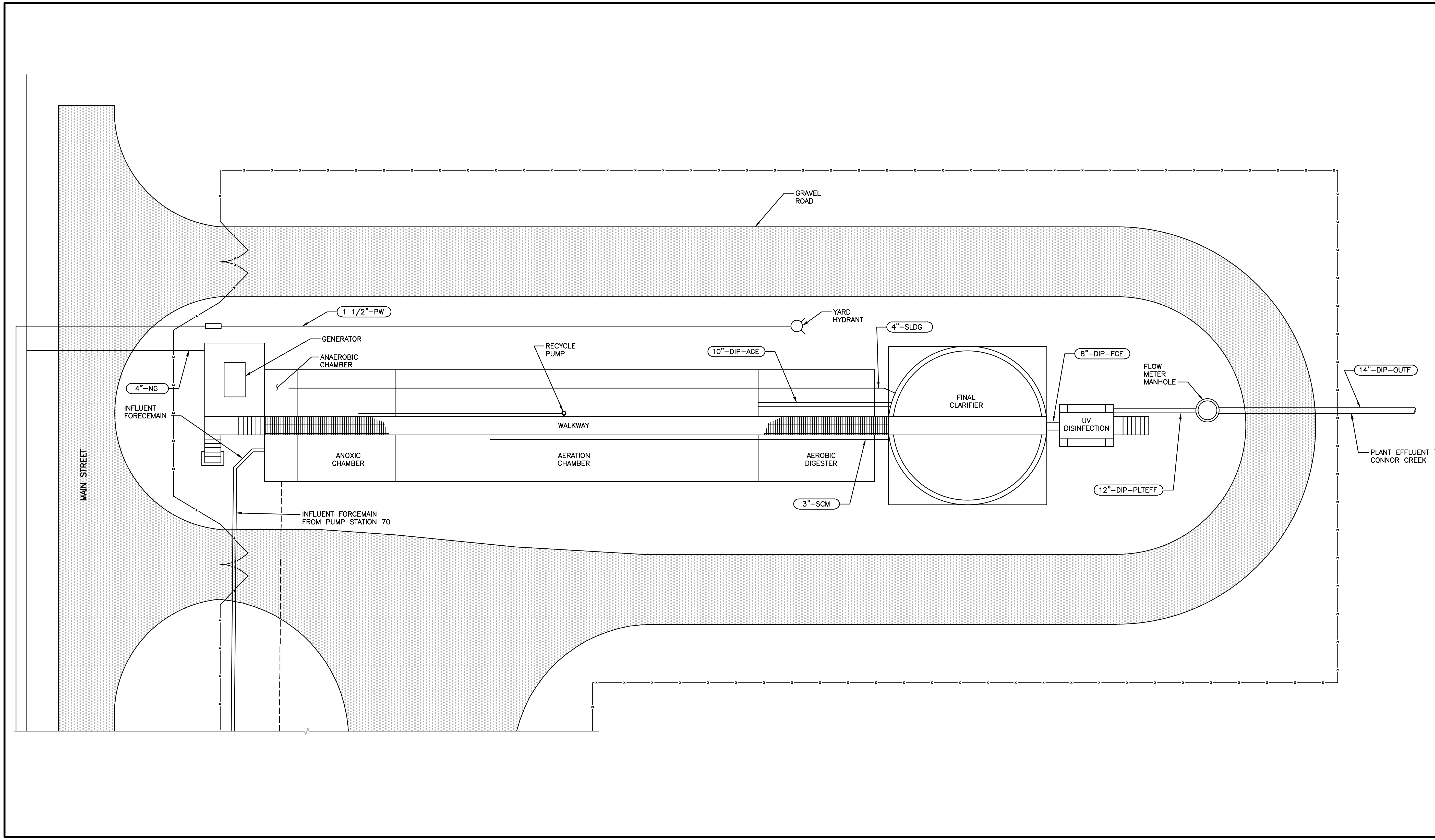


Figure 2-21

Wolcott WWTP Process Flow Diagram



Pipe Abbreviations

ACE	AERATION CHAMBER EFFLUENT
FCE	FINAL CLARIFIER EFFLUENT
INFFM	INFLUENT FORCEMAIN
NG	NATURAL GAS
OUTF	OUTFALL SEWER
PLTEFF	PLANT EFFLUENT

Pipe Abbreviations Cont.

PW	POTABLE WATER
SCM	SCUM
SLDG	SLUDGE

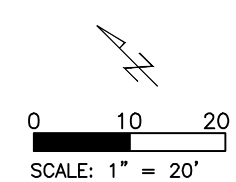


Figure 2-22

Wolcott WWTP Site Location Plan

The capacity evaluation identified that the plant currently has adequate capacity to treat its design average daily flow of 0.288 mgd and a maximum 3:1 throughput of 0.86 mgd. However, flows to the WWTP are near the design capacity, necessitating an expansion. Based on future growth projections, the Wolcott WWTP will need to be expanded, which will require construction of a new facility as the existing plant is a small package plant that cannot be expanded to meet future needs. The projected Year 2033 average daily flows to Plant 20 and Wolcott WWTP are presented in Table 2-20.

Refer to the *SSS Characterization Report* for details of the capacity analysis. Refer to Section 6.0 of this IOCP for recommended improvements to address the need for treatment capacity expansion.

2.2.6.5.3 WWTP 14

WWTP 14 is located in the Morris Creek Basin and was evaluated as part of the non-modeled system analysis task. Based on the design flows defined in the WWTP 14 Improvements (2005) construction documents, the plant has a peak design capacity of 0.58 mgd. WWTP 14 serves a total developed area of 120 acres, approximately 85 acres are residential and 35 acres are industrial.

Flow meter data was collected for the WWTP 14 service area in 2013. The measured average day dry flow and peak day dry flow were used to project the peak wet weather flows for the two-year and five-year storm events. The capacity analysis indicated a two-year peak flow of 234 gpm and five-year peak flow of 262 gpm compared to the 400 gpm treatment capacity.

Significant additional development is not anticipated in the WWTP 14 service area prior to Year 2033; therefore, the plant has adequate capacity to treat existing flows as well as projected growth during the 20-year planning period.

2.2.6.5.4 WWTP 3

WWTP 3 is located on Brenner Drive in the extreme northern part of the service area near the Missouri River. The plant is in a predominantly unsewered part of the community, and serves only a behavioral health hospital and sanitary waste from a water treatment facility. The sewer system delivering flow to the plant is privately owned and operated.

Due to its small size, the WWTP was not evaluated as part of the non-modeled system analysis task. Additional development is not anticipated in the WWTP 3 service area and the WWTP has adequate capacity to treat existing flows.

2.2.6.6 Summary of SSS Capacity Analysis

The entire modeled system can adequately handle dry weather flows. The capacity analysis results indicated that the majority of the modeled system within the SSS basins has sufficient capacity to convey current peak wet weather flows generated by the design storm events. Seventy-three percent of the modeled pipes have sufficient capacity to convey the two-year storm event, while over 60% of the pipes have capacity to convey peak five-year storm event flows. While the overall performance of the collection system was good, there are significant capacity issues identified at some locations within the SSS system.

A summary of the hydraulic modeling results for existing Year 2013 and projected Year 2033 conditions are presented for two-year and five-year storm events in Table 2-21 and Table 2-22, respectively.

Table 2-21: SSS Surcharge Conditions Summary for Two-Year Storm Event

Design Year	Length of Sewer (ft)				Number of Pipe Segments (each)		
	Length in Surcharge Condition	Percent of System in Surcharge	100-150% Capacity Utilization	>150% Capacity Utilization	Segments in Surcharge	100-150% Capacity Utilization	>150% Capacity Utilization
2013	115,973	25%	20,247	32,801	349	97	90
2033	124,452	27%	24,863	36,115	517	106	101

Table 2-22: SSS Surcharge Conditions Summary for Five-Year Storm Event

Design Year	Length of Sewer (ft)				Number of Pipe Segments (each)		
	Length in Surcharge Condition	Percent of System in Surcharge	100-150% Capacity Utilization	>150% Capacity Utilization	Segments in Surcharge	100-150% Capacity Utilization	>150% Capacity Utilization
2013	167,924	36%	40,445	56,311	569	173	198
2033	186,547	40%	54,556	57,250	614	212	202

2.3 Stormwater System

Comprised of over 300 miles of pipe, the SSS storm sewer inventory is provided in Table 2-23.

Table 2-23: Storm Sewer Inventory

Pipe Material	Pipe Length (ft)					
	< 18 inch diameter	18-36 inch diameter	36-54 inch diameter	>54 inch diameter	Unknown	Total
Brick	43	1,910	7,679	4,364	479	14,475
Corrugated Metal Pipe (CMP)	62,286	73,254	32,803	7,811	14,606	190,760
Reinforced Concrete Pipe (RCP)	337,030	487,194	210,800	61,917	2,838	1,099,779
Plastic	40,195	51,047	14,967	47	24,496	130,752
Other	86,677	35,638	7,892	37	345	130,589
Unknown	2,184	2,666	861	220	77,438	83,369
Totals	528,415	651,709	275,002	74,396	120,202	1,649,724

Source: UG GIS data (September 1, 2016).

2.4 Flood Control System

KCK is protected from Missouri River and Kansas River flooding by approximately 20 miles of flood control levees and associated infrastructure. Fifteen flood pump stations are located along or near the levee systems in the UG service area to provide conveyance of interior drainage from low-lying areas adjacent to the rivers during high river stages when gravity conveyance is not possible. Ownership and maintenance responsibilities of the flood control infrastructure vary between the UG, Fairfax Drainage District, Kaw Valley Drainage District, and private entities.

The UG owns and operates nine of the fifteen flood pump stations as listed in Table 2-24. Flood Pump Station No. 2, also known as the Argentine Stormwater Station, operates somewhat differently than the others in that it is not located at the levee for operation only in the case of high river stages. Flood Pump Station No. 2 conveys stormwater during most rain events to alleviate flooding in the 24th and Strong Avenue area of the Argentine Basin. When flows in the separate system reach a certain level, separate stormwater flow is diverted from entering the CSS. This station lifts separate stormwater flows to the Ruby Avenue storm sewer, which then flows to the Kansas River.

Table 2-24: Flood Pump Station Inventory

Pump Station ID	Pump Station Common Name	Basin	Address	Pump Rated Capacity[1] (gpm)
1	Ohio Flood Pump Station	CID	10 Market Street	1@17,450 1@6,800
2	Argentine Stormwater Station	Argentine	24th and Strong Avenue	3@10,000
10	Shawnee Avenue Flood Pump Station	Armourdale	9 Shawnee Avenue	3@16,000 1@11,000
11	Fifth Street Flood Pump Station	Armourdale	1137 South 5th Street (North Levee)	3@13,000
12	Mill Street Flood Pump Station	Armourdale	1197 South Mill Street (North Levee)	2@8,000
13	Twelfth Street Flood Pump Station	Armourdale	1171 South 12th Street (North Levee)	2@8,000
14	Osage Flood Pump Station	Armourdale	2105 Osage Avenue (East Levee)	2@8,400 1@1,850
15	Strong Avenue Flood Pump Station	Argentine	1717 Strong Avenue (South Levee)	2@8,000
16	New Central Flood Pump Station	CID	295 Central Avenue	3@27,000

Note:
1. Pump nameplate capacity.

Flood Pump Station No. 2 is the only flood pump station materially affecting the CSS. This station conveys separate stormwater to the river and reduces stormwater flow to the CSS. The rest of the flood pump stations only operate during high river stages and; thus, do not have any effect on the CSS. In the event of rainfall events during high river stages, the flood pump stations would likely reduce conveyance of overflows to the rivers given that the pump station capacities are significantly less than the gravity conveyance capacities of the outfall pipes through the levees.

2.5 Receiving Water Characterization

This section provides a summary of the receiving water characterization. The study area includes reaches of the Kansas River and the Missouri River as well as tributaries to those systems that are located within the following Hydrologic Unit Code (HUC) 8-digit watersheds:

- Lower Kansas (HUC 10270104).
- Lower Missouri – Crooked (HUC 10300101).

Figure 2-23 depicts the approximate extent of the study area. Both the Missouri River and Kansas River watersheds include large upstream drainage areas. The Missouri River at the Broadway Bridge in KCMO drains a total of 484,100 square miles (United States Geological Survey [USGS] information for gage #06893000). That area includes 59,756 square miles tributary to the Kansas River at DeSoto, Kansas (USGS information for gage #06893000) as well as land areas draining to the Kansas River between DeSoto and the mouth. DeSoto is located approximately 30 miles upstream of the confluence of the Missouri River and Kansas River. There are four classified stream segments located within the UG service area that currently receive combined sewer overflows:

- Kansas River.
- Missouri River.
- Jersey Creek (part of the Goose Island-Missouri River 12-digit HUC 102400110608).
- Mattoon Creek (part of the Turkey Creek-Kansas River 12-digit HUC 102701040607).

Some CSOs discharge to small drainage conveyances before reaching the classified stream segments, including the CSOs that discharge through Esplanade Creek. Although shown on Figure 2-23, Turkey Creek does not receive CSO discharge from the UG CSS.

Figure 2-23: CSO Receiving Water Bodies

2.5.1 Hydraulic Characteristics

The hydraulic characteristics of the UG receiving water bodies have a significant influence on the magnitude and duration of *Escherichia* coli (E. coli) levels. The Kansas and Missouri Rivers are very large river systems. Average annual flows in the Missouri River are approximately 56,100 cubic feet per second (cfs) in the study area, and average annual flows in the Kansas River are approximately 7,220 cfs in the study area. Therefore, flow and water quality conditions upstream of the UG service area strongly influence the conditions within the study area. Flow monitoring data are available from the USGS for the Kansas River at DeSoto (gage #06892350) and the Missouri River at KCMO (gage #06893000), as well as for additional Missouri River sites located upstream and downstream of the study area. Jersey Creek is a completely urbanized watershed with a combined sewer drainage area of approximately 5.7 square miles.

Jersey Creek is significantly modified, with substantial portions routed through culverts or concrete channels. Jersey Creek flows into the Missouri River just upstream of Kaw Point Park and the confluence with the Kansas River. Mattoon Creek is also a completely urbanized watershed with a combined sewer drainage area of approximately 1.3 square miles. Similar to Jersey Creek, significant modifications of Mattoon Creek include substantial portions routed through culverts. Mattoon Creek flows into the Kansas River just downstream of the Interstate 635 bridge. Turkey Creek, which discharges into the Kansas River from the south near the Kansas-Missouri state line, receives separate stormwater discharges but does not receive CSO discharges from the UG. Flow monitoring data are not available for Jersey Creek, Mattoon Creek, Turkey Creek, or any other tributaries to the Kansas or Missouri Rivers within the UG CSS area. The Kansas River flows into the Missouri River, so all UG CSS discharges are eventually routed to the Missouri River.

2.5.2 Water Quality Characteristics

While the IOCP addresses water quality impacts from UG CSOs, other sources of pollutants also require consideration. Separate stormwater outfalls and urban runoff, both upstream of the CSOs and throughout the CSO reaches, may contribute a variety of pollutants, including bacteria, solids, metals, nutrients, and pesticides. Understanding separate stormwater impacts on water quality is important when assessing the benefits potentially gained by implementing CSO controls. This is a critical issue in the assessment of combined sewer separation as a potential CSO control, as the stormwater component would not only continue to influence receiving water quality, but become a more significant contributor in terms of both discharge volume and pollutant loading.

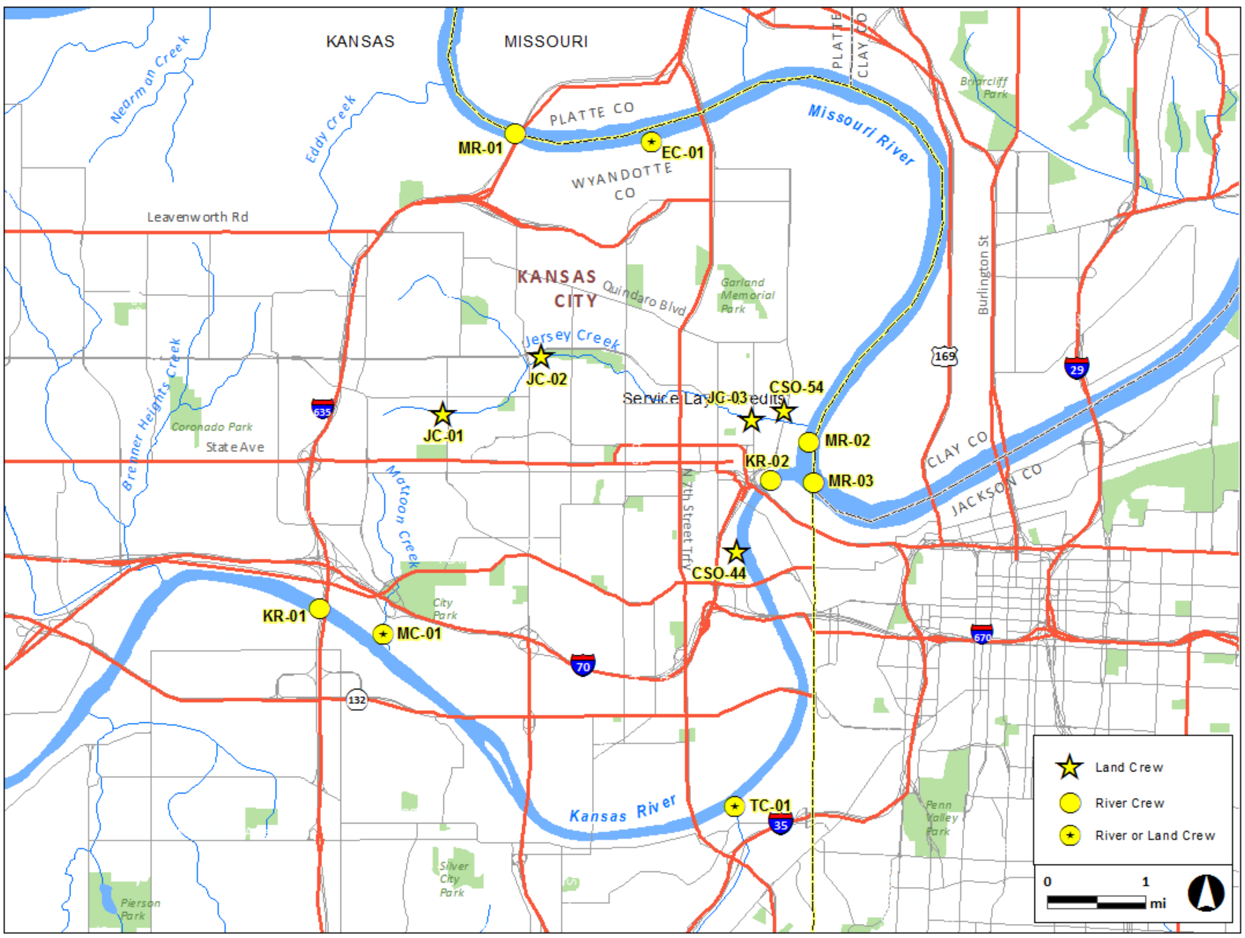
Agricultural sources of pollution include runoff from fields and animal feeding operations. These sources contribute solids, bacteria, nutrients, and pesticides to the receiving streams that may affect the quality of the water entering the CSO reaches. Monitoring water quality upstream of the CSOs is important in assessing the potential impacts of agricultural sources. The UG water quality monitoring efforts conducted during 2013 included upstream monitoring. This data, along with additional data sources, was used to assess the importance of upstream conditions.

A number of municipal and industrial WWTPs discharge in various watersheds upstream and downstream of the UG CSOs. CSOs from the KCMO CSS also discharge to the Kansas and Missouri Rivers, with the KCMO Turkey Creek CSO representing a significant CSO discharge to the Kansas River. Information on pollutant loadings from these facilities were evaluated and incorporated into the model to support a comprehensive assessment of water quality conditions within the UG CSS area.

The UG service area also includes some individual septic systems. While septic systems were not included in the modeling evaluation, failing septic systems have the potential to contribute E. coli to the receiving waters.

Water quality conditions in the Kansas River, Missouri River, Jersey Creek, and other key locations were evaluated using data collected during the UG monitoring effort conducted in 2013 as well as additional data sources. Sampling was conducted at two locations within the Kansas River (KR-01, KR-02) and three locations in the Missouri River (MR-01, MR-02, MR-03), as shown on Figure 2-24. Water quality of CSO discharges was evaluated by sampling event discharges for CSO 44 and CSO 54. The outlets of Mattoon Creek (MC-01) and Esplanade Creek (EC-01) were also sampled to characterize CSO contributions from these drainage areas. In addition, the quality of separate stormwater was evaluated by sampling an upstream location in Jersey Creek (JC-01) and a location at the mouth of Turkey Creek (TC-01). The results from the UG monitoring effort, as well as additional data sources, were used to develop boundary conditions for upstream, CSS, and separate stormwater sources and calibrate the water quality model.

Figure 2-24: Water Quality Sampling Locations



2.5.3 Applicable Water Quality Standards

This section summarizes the water quality standards that are applicable for the UG receiving water bodies, i.e., the Kansas River, Missouri River, Jersey Creek, and Mattoon Creek.

2.5.3.1 Kansas Water Quality Standards

The Kansas River is subject to the water quality standards established by the KDHE in the Kansas Surface Water Register (KDHE, 2013), the Kansas Surface Water Standards (K.A.R. 28-16-28b through 28-16-28g) (KDHE, 2015b), Tables of Numeric Criteria (KDHE, 2015a), and Implementation Procedures (KDHE, 2012). The beneficial uses of the Kansas River that are relevant to bacteria include Primary Contact Recreation (PCR) – Classes “A”, “B”, and “C”; and Secondary Contact Recreation (SCR) – Classes “a” and “b”. The numeric criteria for these beneficial uses are summarized in Table 2-25.

Table 2-25: KDHE E. coli Criteria for Classified Stream Segments

Beneficial Use Designation	E. Coli Criteria Concentration (Colony Forming Units (CFUs)/100 mL)	
Primary Contact Recreation (PCR) Class	Geomean (Apr. 1 - Oct. 31)	Geomean (Nov. 1 - Mar. 31)
A	160	2,358
B	262	2,358
C	427	3,843
Secondary Contact Recreation (SCR) Class	Geomean (Jan. 1 - Dec. 31)	
a	2,358	
b	3,843	

Reaches of the Kansas River and Missouri River that are located within the State of Kansas are currently classified as PCR – Class “B.” Therefore, the E. coli criterion for those water bodies is 262 CFUs/100 mL during the recreation season (April 1 through October 31). Jersey Creek is classified as a SCR – Class “a” stream with a criterion of 2,358 CFUs/100 mL for January through December. Mattoon Creek is classified as PCR – Class “B” with a criterion of 262 CFUs/100 mL during the recreation season (April 1 through October 31). KDHE Implementation Procedures for indicating impairment of these criteria consider the geometric mean (geomean) of five samples collected within 30 days (KDHE, 2012).

2.5.3.2 Missouri Water Quality Standards

The numeric criteria established by the Missouri Department of Natural Resources (MoDNR) for bacteria are tabulated in Table 2-26 (MoDNR, 2014). Of the receiving water bodies affected by UG CSO discharges, only the reaches of the Missouri River are subject to these criteria. The Missouri River is currently classified by MoDNR for “Whole Body Contact – Class B”; therefore, an E. coli criterion of 206 CFUs/100 mL applies for the Missouri River.

Table 2-26: Missouri Numeric Criteria for Bacteria

Beneficial Use Designation	E. coli Criteria Concentration[1] (CFUs/100 mL)
Whole Body Contact - Class A (WBC-A)	126
Whole Body Contact - Class B (WBC-B)	206
Secondary Contact Recreation (SCR)	1,134

Note:

1. Numeric criteria apply to a geometric mean computed for the recreation season (April 1 through October 31).

2.5.3.3 Stream Classification and Uses

As discussed above, reaches of the Kansas River and Missouri River that are located within the State of Kansas are currently classified Primary Contact Recreation. The KDHE regulations define primary contact recreation as follows:

> *"Primary contact recreational use for classified surface waters other than classified stream segments" means the use of classified surface waters other than classified stream segments for recreation on and after April 1 through October 31 of each year, during which the body is immersed to the extent that some inadvertent ingestion of water is probable. This use shall include boating, mussel harvesting, swimming, skin diving, waterskiing, and windsurfing."*

However, none of the uses listed above apply to Jersey Creek, Mattoon Creek, or other small urban waters in the service area. These waters appear to fit the definition of Secondary Contact Recreation from the KDHE regulations as follows:

> *"Secondary contact recreational use for classified surface waters other than classified stream segments" means recreation during which the ingestion of classified surface waters other than classified stream segments is not probable. This use shall include wading, fishing, trapping, and hunting."*

The KDHE has appropriately designated Jersey Creek for Secondary Contact Recreation. However, Mattoon Creek is clearly unsuitable for Primary Contact Recreation and should be reclassified as Secondary Contact Recreation by the KDHE. While this characterization evaluates meeting the KDHE uses and criteria as written, it may be appropriate to evaluate Secondary Contact Standards for Mattoon Creek.

Flow conditions controlled by natural conditions and hydrologic modifications to the rivers and watersheds in the UG service area have affected recreational use of all the receiving water bodies. Because of these conditions, there are times when the Primary and Secondary Contact Recreational uses do not exist.

2.5.3.4 303(d) Impairment Listings and Total Maximum Daily Loads (TMDLS)

States are required by the EPA to assess waters and place those that do not meet applicable water quality standards on a 303(d) list of impaired waters and develop Total Maximum Daily Loads (TMDLs) for those waters. The 303(d) listings and TMDLs applicable for the UG CSO receiving streams include the following:

- No 303(d) listings or TMDLs exist for Jersey Creek or Mattoon Creek.

- TMDLs for chlordane and polychlorinated biphenyls (PCBs) in the Missouri River were prepared by the MoDNR and approved by the EPA in 2006. These TMDLs include the entire Missouri River in or bordering Missouri. The TMDLs noted that production of both substances is banned and concluded that levels in the environment are expected to decline and discharges from point sources are negligible. Accordingly, chlordane and PCBs were not evaluated in the development of the IOCP.
- There is a 303(d) listing in Kansas for impaired aquatic life due to excess sediment/total suspended solids in the Lower Kansas River. A TMDL has not been developed and it is listed as a low priority by the KDHE with a TMDL development target date in 2023. The impairment appears to be primarily driven by upstream loadings.
- There is a 303(d) listing in Kansas for impaired recreation due to E. coli in the Lower Kansas River. A TMDL was prepared by the KDHE and approved by the EPA in 2000. E. coli is the primary parameter of concern in the development of this IOCP.
- There is a 2014 303(d) listing in Kansas for impaired aquatic life due to total phosphorus in the Lower Kansas River. A TMDL is in the process of being developed by the KDHE with a target date of 2016. The relative loading of phosphorus from CSOs, as compared to loadings from upstream sources, is expected to be negligible given the large Kansas River watershed and the intense agricultural activity in the watershed. Phosphorus loadings are expected to be quite small from intermittent CSOs. The impairment is being driven primarily by upstream loadings of phosphorus.
- There is a 1998 303(d) listing for impaired aquatic life due to biology/sediment in the Lower Kansas River. The listing is based on low biological scores as well as high nutrient and biological oxygen demand (BOD) levels. A TMDL was prepared by the KDHE and approved by the EPA in 2000. The TMDL focused on nutrients and BOD from non-point sources. The relative loading of nutrients and BOD from CSOs, as compared to loadings from upstream, is expected to be negligible given the large Kansas River watershed and the intense agricultural activity in the watershed.
- There is a 303(d) listing for the Missouri River in 2010 by MoDNR for impaired recreational uses due to E. coli. TMDL development is scheduled for 2025.

There are also 303(d) listings and TMDLs applicable to other non-CSO receiving streams in Wyandotte County:

- There is a 1998 303(d) listing for impaired aquatic life in Big Eleven Lake due to eutrophication. It is listed as a low priority but a TMDL was developed and approved August 28, 2001. The TMDL attributes the impairment predominantly to nonpoint source pollutants. The assessment suggests that urban runoff contributes to the elevated total phosphorus concentrations in the lake.
- There is a 2006 303(d) listing for impaired aquatic life in Wyandotte County Lake due to eutrophication. It is listed as a high priority water body. A TMDL was developed and approved in 2007. The TMDL attributes the impairment to point sources and nonpoint sources. The primary point source is the UG Phase I MS4 Permit. The TMDL requires the UG to direct control practices for developing land in the watershed. The TMDL states likely nonpoint sources include stormwater runoff, leaking septic systems, and animal waste runoff and infiltration through soil and groundwater.

2.5.3.5 Pollutant of Concern

E. coli has been determined to be the primary pollutant of concern as discussed in the *SSE Work Plan*. E. coli is the primary concern because of the high levels typically found in CSO discharges, the existing 303(d) listing of impairment in the Kansas River and associated TMDL (KDHE, 2006), the 303(d) listing on impairment in the Missouri River (MoDNR, 2014), and the potential human health concerns related to pathogen exposure. Thus, E.coli was used to assess water quality benefits under alternative CSO control scenarios.

2.5.4 Receiving Stream Modeling

Water quality modeling of the receiving waters links the sources of pollutants to ambient conditions in the streams. A water quality model builds understanding of the cause-and-effect relationships between CSOs and other pollutant sources with water quality in the receiving waters. The principal purpose of the water quality model is to address the demonstration approach of the *CSO Control Policy*, i.e., address the following requirements:

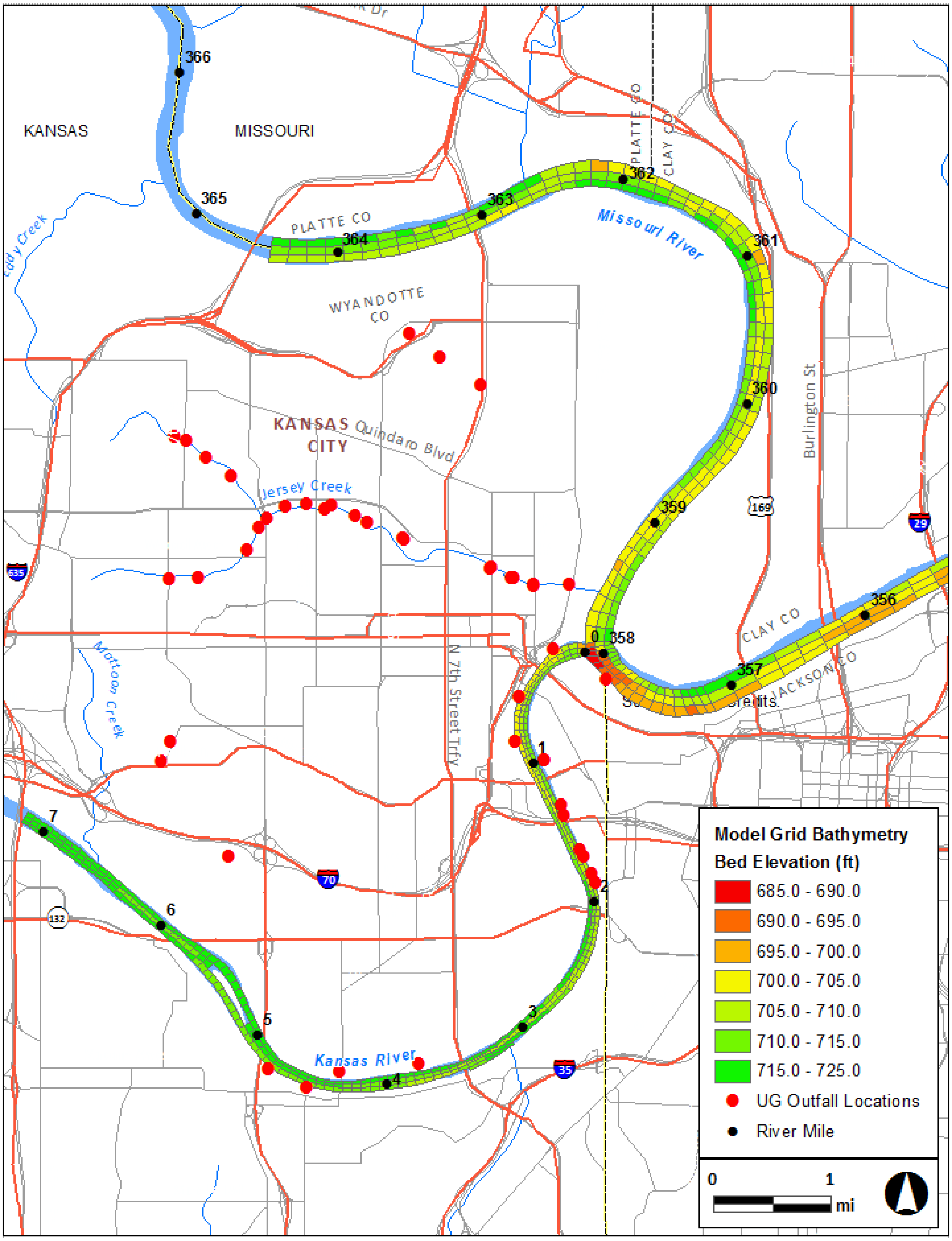
- The planned control program is adequate to meet water quality standards (WQS) and protect designated uses, unless WQS or uses cannot be met because of natural background conditions or pollution sources other than CSOs.
- The CSO discharges remaining after implementation of the planned control program will not preclude the attainment of WQS or the receiving waters' designated uses or contribute to their impairment.
- Hydrodynamic and water quality models of receiving waters are developed based on:
  - Physical characteristics of receiving waters.
  - CSO discharges and pollutant loads from the CSS model and water quality data.
  - Inflows and pollutant loads from other sources in the watershed.

The *CSS Characterization Report* describes the development of water quality modeling tools to represent the loading, transport, and fate of E. coli through the UG receiving water bodies. The *CSS Characterization Report* includes a discussion of the selection, development, and calibration of a modeling framework for the UG's receiving water bodies. Based on the management objectives, model domain characteristics, and programmatic constraints, the following modeling frameworks to support the development of the IOCP were selected:

- Kansas River and Missouri River: A two-dimensional (2D) depth-averaged *Environmental Fluid Dynamics Code* (EFDC) model to represent hydrodynamics and basic loading, transport, and fate processes for pollutants, including advection, dispersion, and bacterial decay.
- Jersey Creek and Mattoon Creek: Basic spreadsheet calculations to quantify CSO and separate stormwater discharges and pollutant loading (and spatial distribution) to the creeks, daily concentrations of E. coli in the creeks, and the ultimate flow and pollutant loading contributed from the creeks to the Kansas and Missouri Rivers.

The models were developed to assess the primary parameter of concern, E. coli bacteria. Figure 2-25 presents the EFDC model grid and bathymetry in the UG service area.

Figure 2-25: EFDC Model Grid and Bathymetry



2.5.5 Existing Condition Simulation

A calibrated receiving water quality model was used to simulate existing conditions for a design year recreation season (April through October 2001), which was based on precipitation and streamflow conditions observed in 2001. The intent of this application of the model was to assess current attainment of applicable water quality standards and to quantify the relative importance of various sources of E. coli at key locations in the receiving water system. The "existing conditions" simulation also established a baseline condition to which model simulations of CSO control alternatives were compared to assess the relative benefits as simulated by the model.

The calibrated CSS hydraulic model was used to generate overflow hydrographs for the Design Year for an existing conditions simulation. The existing conditions simulation represented upstream baseline conditions on the Kansas River and Missouri River.

Table 2-27 provides a component summary of the flows in the Kansas and Missouri Rivers. Upstream flow is the dominant flow component for both rivers (>99.6%). Collectively, the UG CSS sources contribute only 0.029% of the flow to the Kansas River and 0.01% of the flow to the Missouri River. By comparison, the (KCMO) Turkey Creek CSS contributes 0.116% of the flow to the Kansas River and 0.02% of the flow to the Missouri River.

Table 2-27: Flow Balance Summary for Existing Conditions Recreation Season

Receiving Water Body	Upstream	UG CSS Sources[1]	KCMO CSS Sources[2]	Separate Stormwater	WWTP[3]
Kansas River	99.765%	0.029%	0.116%	0.09%	--
Missouri River[4]	99.63%	0.01%	0.02%	0.23%	0.11%

Notes:
1. Includes only CSS discharges for UG sources.
2. Represents KCMO Turkey Creek CSS discharges, based on design storm hydrographs.
3. Includes the Kaw Point WWTP and KCMO Westside WWTP discharges.
4. Includes inflows to both the Kansas River and the Missouri River.

Table 2-28 provides a component summary of the E. coli loading to the Kansas and Missouri Rivers. Key observations for the Kansas River based on the information in the table include:

- Upstream sources contribute roughly 61.7% of the total E. coli load during the recreation season.
- UG CSS sources represent roughly 21.1% of the loading, while the (KCMO) Turkey Creek CSS contributes about 14.2% of the total load.
- Separate stormwater is a minor source of E. coli loading between Interstate 635 and the mouth relative to upstream and CSS sources.

Key observations for the Missouri River based on the information in the table include:

- Upstream sources, including loads from both the Kansas and Missouri upstream boundaries, represent about 88.7% of the total E. coli loading.
- Relative loading contributions of the UG CSS discharges (6.8%) are about double the (KCMO) Turkey Creek CSS discharges (3.1%).
- Separate stormwater and WWTP discharges are minor contributors to the overall E. coli loading.

Table 2-28: E. coli Loading Summary for Existing Conditions Recreation Season

Receiving Water Body	Upstream	UG CSS Sources[1]	KCMO CSS Sources[2]	Separate Stormwater	WWTP[3]
Kansas River	61.7%	21.1%	14.2%	0.5%	--
Missouri River[4]	88.7%	6.8%	3.1%	1.4%	0.02%

Notes:

1. Includes only CSS discharges for UG sources.
2. Represents KCMO Turkey Creek CSS discharges, based on design storm hydrographs.
3. Includes the Kaw Point WWTP (with disinfection operational) and KCMO Westside WWTP discharges.
4. Includes inflows to both the Kansas River and the Missouri River.

2.5.6 Evaluation of Kansas River and Missouri River Compliance with Water Quality Standards

The model-simulated E. coli concentrations for the baseline existing conditions were compared against the Primary Contact Recreation – Class B standard of 262 CFUs/100 mL on a calendar month basis in the Kansas and Missouri Rivers. Figure 2-26 indicates that the monthly geomeans on a reach-average basis exceed 262 CFUs/100 mL for multiple months during the recreation season in each river. For the Kansas River, the reach-average is calculated from the Interstate 635 bridge to the confluence with the Missouri River. For the Missouri River, the reach-average is from the Interstate 635 bridge to the state line.

Figure 2-26: Simulated Existing Conditions E. coli Monthly Geomean – Kansas River and Missouri River

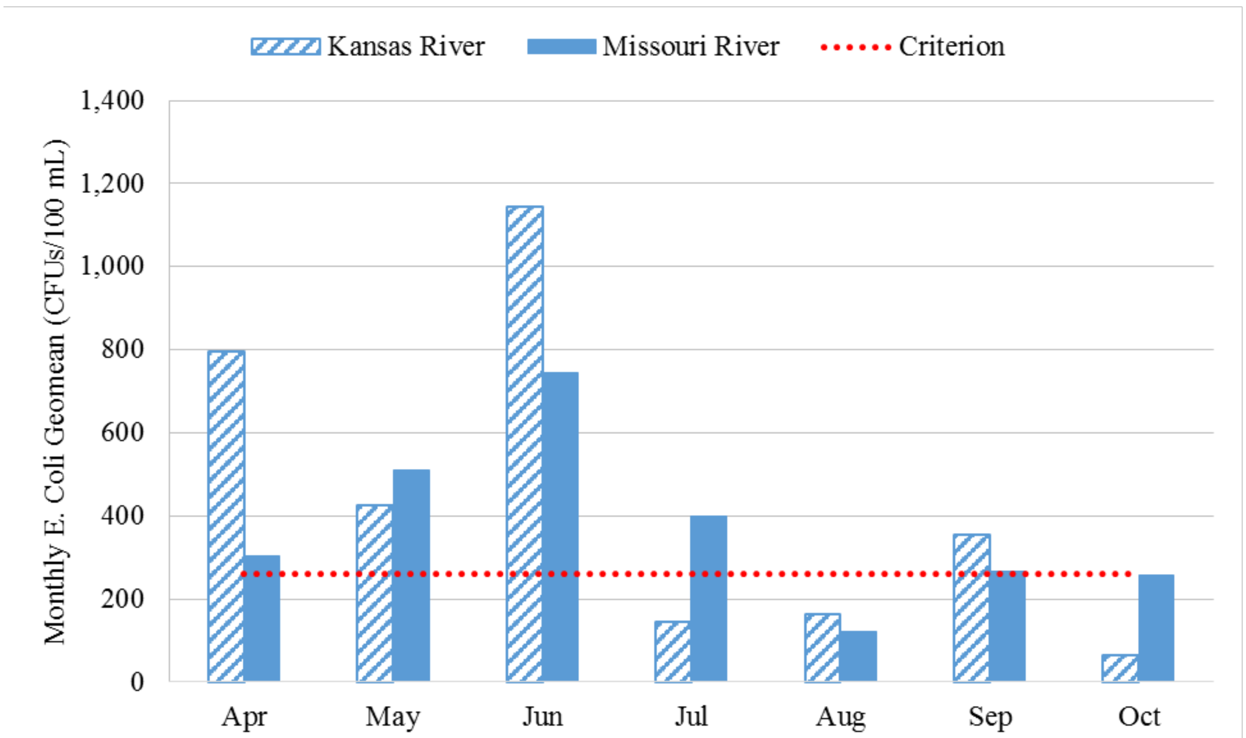


Figure 2-27 presents the maximum monthly geomean in each model transect in the Kansas River from the Interstate 635 bridge to the confluence with the Missouri River. This figure shows that the upstream boundary condition drives the maximum monthly geomean. The maximum monthly geomean in the Kansas

River is 1,200 CFUs/100 mL and occurs in June. This is only 46 CFUs/100 mL higher than the upstream boundary geomean in June of 1,154 CFUs/100 mL. Minor increases are noted where CSOs or significant separate stormwater sources enter. As shown, loads from the UG system do not significantly influence WQS attainment in the Kansas River.

Figure 2-27: Simulated Existing Conditions E. coli Maximum Monthly Geomean by Model Transect in the Kansas River

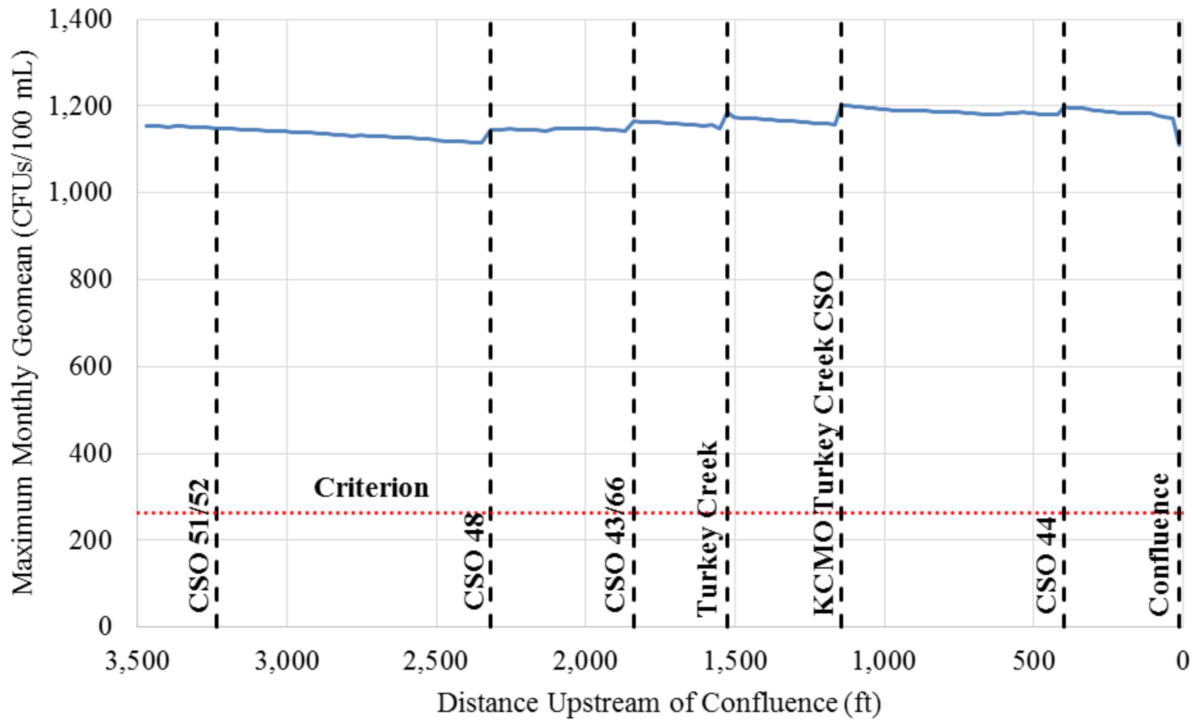
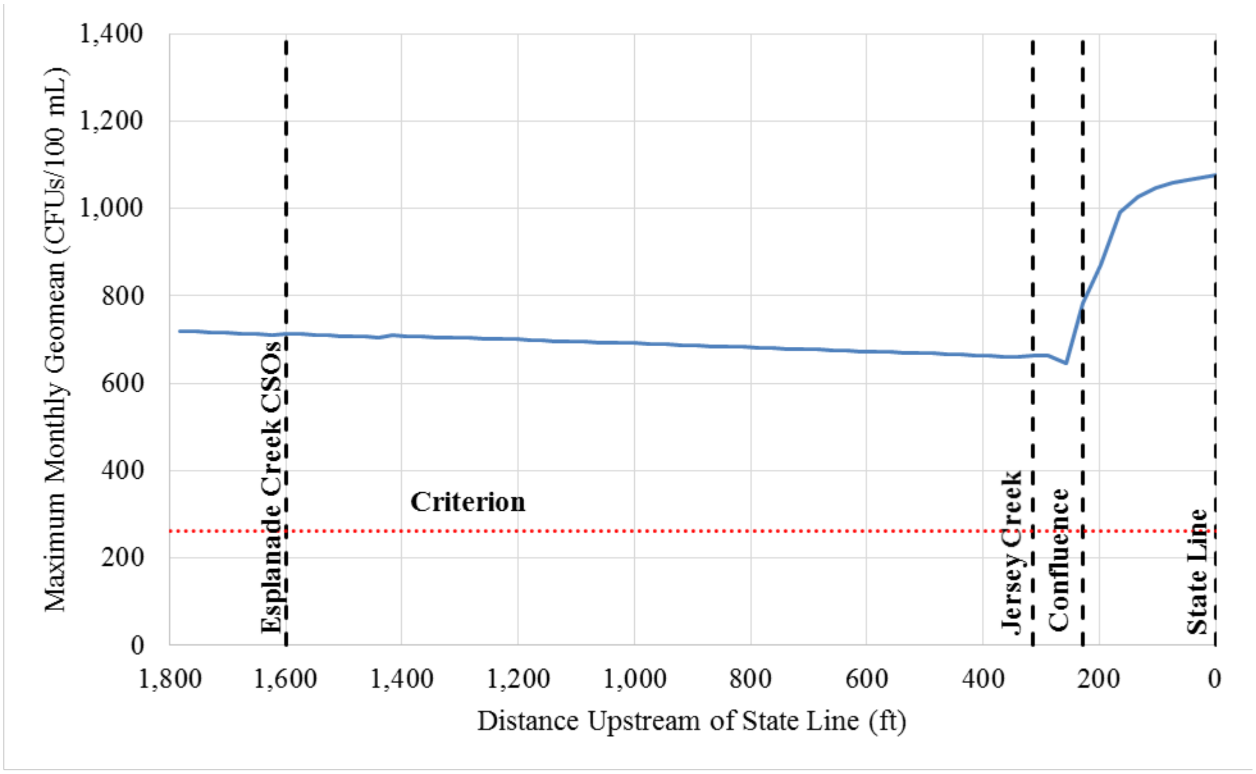


Figure 2-28 presents the maximum monthly geomean for each model transect in the Missouri River from the Interstate 635 bridge downstream to the state line. The maximum monthly geomean in the Missouri River is 1,076 CFUs/100 mL and occurs in June as well. This is 357 CFUs/100 mL higher than the upstream boundary geomean in June of 719 CFUs/100 mL. The higher concentrations entering at the confluence with the Kansas River drive this observed increase. The UG CSOs entering the Missouri River, either directly or through Esplanade Creek or Jersey Creek, do not significantly increase the maximum monthly geomean values. As shown, loads from the UG system do not significantly influence WQS attainment in the Missouri River.

Figure 2-28: Simulated Existing Conditions E. coli Maximum Monthly Geomean by Model Transect in the Missouri River



Overall, comparison of the results across the existing conditions simulation supports the finding that the E. coli loading associated with the upstream inflows to the Kansas and Missouri Rivers prevent the attainment of the designated use. Additionally, CSO sources do not significantly increase monthly geomean values above the existing baseline upstream conditions. Therefore, pollutant sources other than CSOs prevent the consistent attainment of water quality standards in the Kansas River and Missouri River under existing conditions.

2.5.7 Evaluation of Jersey Creek and Mattoon Creek Compliance with Water Quality Standards

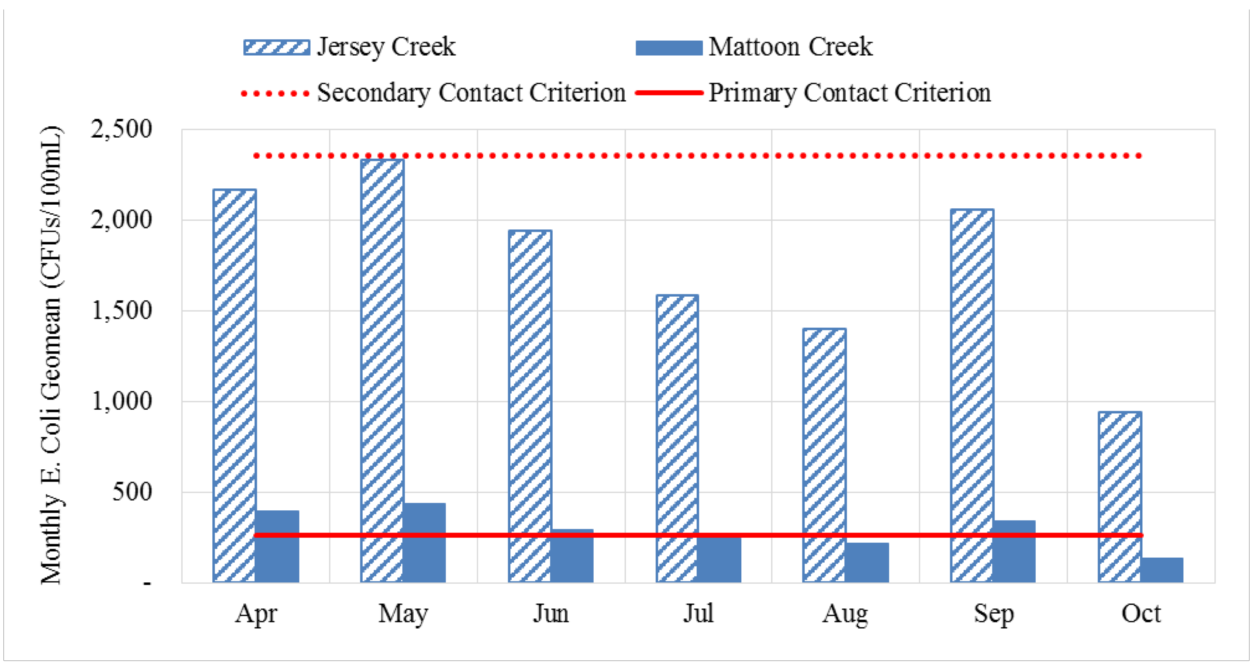
Evaluations of the Design Year recreation season for Jersey Creek and Mattoon Creek were also conducted. The Secondary Contract Recreation - Class a criterion applies to Jersey Creek, which is 2,358 CFUs/100 mL as a geomean, and the Primary Contact Recreation - Class B criterion applies to Mattoon Creek, which is 262 CFUs/100 mL. Simulated separate stormwater runoff and CSO discharges were compiled on a daily basis in each creek. Travel time within each creek is less than a day. Therefore, the combined discharges on a given day were considered representative of the conditions in the stream on that day. The Jersey Creek analysis did not include CSS discharges from CSOs 54 and 86 because they entered the creek at the downstream end where the system is in enclosed culverts until it discharges into the Missouri River.

On days with no discharge to the streams, a “background” concentration based on an evaluation of available data was assumed. The USGS collects one sample per year from three Jersey Creek locations, totaling eight samples between 2007 and 2015 that do not appear to be impacted significantly by wet weather events. The UG sampling effort in 2013 collected routine samples from three locations in Jersey Creek and one location at the mouth of Mattoon Creek, for a total of twenty-one samples in Jersey Creek and four samples in Mattoon Creek that do not appear to be impacted by wet weather events. The median value of these dry weather samples is 631 CFUs/100 mL in Jersey Creek and 89 CFUs/100 mL in Mattoon Creek. These values are below the applicable criterion in each stream. Also, during dry weather conditions, the flow and water depth in these streams is very low and exposure is likely very limited.

Figure 2-29 presents the simulated monthly geomeans for the two creeks. The Secondary Contact criterion is met in Jersey Creek in all seven recreation months. Since the monthly geomean is below the applicable criterion, continued implementation of the NMC Plan is adequate to meet the demonstration approach in Jersey Creek.

The primary contact criterion is exceeded in Mattoon Creek in four of the seven recreation months. These exceedances are largely driven by the separate stormwater inputs that have an assigned concentration of 8,051 CFUs/100 mL. The existing Design Year CSO discharges into Mattoon Creek are very small volume, occur only twice during the recreation season, and have very little impact on the calculation of the monthly geomean. Water quality standards and uses cannot be consistently met in Mattoon Creek due to pollution sources other than UG CSOs. However, as noted above, Mattoon Creek is incorrectly classified as a Primary Contact Recreation water body. The characteristics of Mattoon Creek indicate the correct classification is Secondary Contact Recreation. As shown on Figure 2-29, Mattoon Creek meets the Secondary Contact criterion.

Figure 2-29: Simulated Existing Conditions E. Coli Monthly Geomean –Jersey Creek and Mattoon Creek



2.6 Public Health

The UG assessed the potential health impacts associated with CSO discharges via a literature review and local health department statistics. The result is that there is no direct documented correlation between CSO control and public health impacts.

The EPA Office of Inspector General recently reported that there are no data showing a direct link between improved water quality from CSO reduction and public health (September 16, 2015). The 2004 *Report to Congress on Impacts and Control of CSOs and SSOs* provides similar conclusions regarding the impact of CSOs on water quality and public health:

- *Section 6.2.1 "Recreational Water, Reported Human Health Impacts,"* states that the source of the pathogens causing waterborne disease outbreaks was not identified in the Center for Disease Control's reports. However, the outbreaks identified were caused by pathogens found in CSOs and SSOs.
- *Section 6.2.1 "Recreational Water, Estimated Illnesses at Recognized Beaches,"* states that the EPA found an absence of direct cause-and-effect data relating to the occurrence of CSO and SSO discharges to human health impacts.
- *Section 6.2.3 "Fish and Shellfish, Reported Human Health Impacts,"* states that direct links to CSO and SSO events as a cause of contamination were not made.

Research was also conducted at the local level by analyzing data obtained from the Wyandotte County Health Department (Waterborne Illnesses in Wyandotte County by Year, 2001-2015). Reported waterborne illnesses included:

- Amebiasis (Entamoeba histolytica).
- Cryptosporidiosis.
- Giardiasis.
- Legionellosis.
- Salmonellosis.
- Hepatitis A.
- Typhoid Fever.
- Shigellosis.

The number of reported waterborne illnesses varied during this time period between 36 in 2013 and 216 in 2005. Similar to findings from the literature review, the actual mode of transmission and location of exposure are not known preventing any conclusions regarding correlation of human health impacts to CSO occurrences.

By reducing CSO discharges, the UG will help to improve receiving water quality. However, it is unlikely that CSO controls will translate to measurable public health benefits.

2.7 Sensitive Area Identification

As detailed in the *SSE Work Plan*, the following sensitive area categories listed in the *CSO Control Policy* were evaluated:

- Outstanding National Resource Waters.
- National Marine Sanctuaries.
- Waters with threatened or endangered species and their habitat.
- Waters with primary contact recreation.
- Public drinking water intakes or their designated protection areas.
- Shellfish beds.

It was determined that no receiving waters should be identified as a sensitive area.

2.8 Priority Area Identification

In addition to evaluating sensitive areas, the UG utilized a procedure to identify areas that show high probability for human contact with CSO-impacted waters and possible adverse effects on significant aquatic habitats. This procedure used five criteria evaluated in the field for each CSO discharge point. The evaluation process for each criterion and the resulting priority rankings are described below.

The five criteria used to evaluate each CSO location were: 1) shoreline accessibility to the CSO discharge point, 2) stream safety for full or partial body contact recreation, 3) land use adjacent to the CSO discharge point, 4) stream use around the CSO discharge point, and 5) shoreline habitat for aquatic species near the CSO discharge point. Each CSO received a score for each criterion, based on the definitions below.

2.8.1 Shoreline Accessibility to CSO Discharge Point

This criterion looked at the ease with which a person could approach a CSO outfall from the shoreline and be exposed to the CSO discharge. The evaluation was independent of the type of land use around the CSO. An easily accessible outfall may be along a cleared shoreline, with little to no slope down to the outfall and low stream velocities. Examples of less inaccessible outfalls would be those along steep, highly vegetated banks, outfalls to underground pipes or culverts, or outfalls along concrete lined channels with vertical banks. Less accessible CSOs score lower under this criterion. Definitions used to create scores for shoreline accessibility were:

- 5 = Easily accessible (open space, gentle slope, walkway, low stream velocity).
- 3 = Approachable, but not fully accessible to discharge.
- 1 = Inaccessible (high bank, overgrown vegetation, discharge to underground culvert or concrete lined channel with vertical banks).

2.8.2 Stream Safety for Full or Partial Body Contact Recreation

This criterion focuses on the physical characteristics of the water body within the vicinity of the CSO outfall. The intent is to assess how safe it is to be in the water around the CSO discharge point. This criterion assumes that the safer the stream segment, the more likely someone could be exposed to CSO-impacted water. For example, a safe area may have a solid river bottom, slow moving water, and could be deep or shallow. A shallow area would support wading while a deep area could support swimming. An unsafe stretch of stream would involve stream flow at a high velocity making it hazardous for swimming or wading. A safe designation under this criterion results in a higher score for a CSO. Definitions used to score CSOs for stream physical safety were:

- 5 = Safe (depth, velocity, bottom substrate support use).
- 3 = Somewhat Safe (may have inadequate bottom substrate).
- 1 = Unsafe (depth, velocity, substrate do not support use).

2.8.3 Land Use Adjacent to the CSO Discharge Point

The UG evaluated the land use surrounding each CSO outfall and classified it as public use, residential, or industrial/commercial. Public land uses such as parks, boat landings, and schools promote the use of the water body more than commercial use. Thus, it is more likely that contact with the CSO-impacted water would occur near a park than adjacent to a factory. CSOs located near land designated for public use receive a high score for this criterion. Definitions used to create scores for adjacent land use were:

- 5 = Public Use (park, boat landing, school).
- 3 = Residential, wooded/riparian.
- 1 = Industrial/Commercial, Roadway.

2.8.4 Stream Use Around the CSO Discharge Point

This criterion focuses on the common, frequent uses occurring in the stream around the CSO outfall. Uses were classified as full body contact recreation such as swimming, partial body contact recreation such as in-stream fishing, and no bodily contact uses such as shoreline fishing. Definitions used to create scores for stream use were:

- 5 = Full body contact recreation (swimming, water skiing).
- 3 = Partial body contact recreation (in-stream fishing).
- 1 = No bodily contact uses (boating, shoreline fishing).

2.8.5 Shoreline Habitat for Aquatic Species near CSO Discharge Point

This criterion relates to the protection of aquatic habitats. A natural, pristine habitat such as a wetland should be protected from CSO-impacted waters. The aquatic communities that live in these habitats are typically highly vulnerable to water pollutants. Shorelines that have been disturbed by the installation of seawalls provide poor habitats for aquatic species. Disturbed shoreline habitats received low scores under this criterion. Definitions used to create scores for aquatic habitat were:

- 5 = Natural, pristine habitats (wetland).
- 3 = Undisturbed, natural cover.
- 1 = Disturbed (seawall, riprap).

2.8.6 Scoring of Priority Areas

Once all the field surveys were completed, the score for each criterion for each CSO location was entered into the matrix and a total score was calculated. The numerical sum for each CSO evaluated will fall between five and 25. For scores less than 15, the stream segment around the outfall was considered to be a low priority area. For CSOs with scores of 12 to 17, the stream segment was considered medium priority. For a score greater than 17, the CSO outfall was considered to be within a higher priority area for assessing control alternatives. The results of the UG’s priority area analysis are shown in Table 2-29.

Table 2-29: Priority Area Assessment Matrix

CSO Diversion ID	Diversion Structure Location	Basin	Receiving Water	Criteria Score					Total Score
				Shoreline Accessibility	Stream Safety	Land Use	Stream Use	Shoreline Habitat	
1	28th Street and Georgia Avenue	Jersey Creek	Jersey Creek	2	1	3	1	1	8
2	Klamm Park	Jersey Creek	Jersey Creek	3	2	5	1	1	12
3	Klamm Park	Jersey Creek	Jersey Creek	3	2	5	1	1	12
4	2319 North 21st Street	Jersey Creek	Jersey Creek	2	1	3	1	1	8
5	2118 Waverly Avenue	Jersey Creek	Jersey Creek	2	1	3	1	1	8
8	29th Street and Freeman Avenue	Jersey Creek	Jersey Creek	2	1	3	1	1	8
9	25th Street and New Jersey Avenue	Jersey Creek	Jersey Creek	2	1	3	1	1	8
10	1852 Glendale Avenue	Jersey Creek	Jersey Creek	3	2	3	1	1	10
11	1932 Glendale Avenue	Jersey Creek	Jersey Creek	2	1	3	1	1	8
14	Parallel Parkway west of 12th Street	Jersey Creek	Jersey Creek	3	2	3	1	1	10
15	North Valley Street, south of Jersey	Jersey Creek	Jersey Creek	3	2	3	1	1	10
16	11th Street and Lafayette Avenue	Jersey Creek	Jersey Creek	3	2	5	1	1	12
17	Across from 2012 Darby Avenue	Jersey Creek	Jersey Creek	2	1	5	1	1	10
18	2003 North 9th Street (in driveway)	Jersey Creek	Jersey Creek	2	1	5	1	1	10

CSO Diversion ID	Diversion Structure Location	Basin	Receiving Water	Criteria Score					Total Score
				Shoreline Accessibility	Stream Safety	Land Use	Stream Use	Shoreline Habitat	
19	9th Street and Walker Avenue	Jersey Creek	Jersey Creek	2	1	5	1	1	10
21	5th Street and Freeman Avenue	Jersey Creek	Jersey Creek	2	2	5	1	1	11
22	5th Street and Walker Avenue	Jersey Creek	Jersey Creek	2	2	5	1	1	11
23	4th Street and Freeman Avenue	Jersey Creek	Jersey Creek	2	1	3	1	1	8
25	3rd Street and New Jersey Avenue	Jersey Creek	Jersey Creek	2	2	3	1	1	9
26	Northeast of 18th Street and Troup Avenue	Jersey Creek	Jersey Creek	4	5	5	2	1	17
27	Esplanade Street and 12th Street	Esplanade Creek	Missouri River	1	1	2	1	1	6
28	Parkwood Boulevard and Esplanade Street	Esplanade Creek	Missouri River	1	1	2	1	1	6
29	10th Street and Esplanade Street	Esplanade Creek	Missouri River	1	1	2	1	1	6
30	7th Street and Manorcrest Drive	FID	Missouri River	3	3	3	1	2	12
31	7th Street and Manorcrest Drive	FID	Missouri River	3	3	3	1	2	12
32	Ohio Avenue and James Street	CID	Missouri River	2	2	1	1	1	7
39	Strawberry Hill Pump Station	Splitlog Creek	Kansas River	3	2	1	2	4	12

CSO Diversion ID	Diversion Structure Location	Basin	Receiving Water	Criteria Score					Total Score
				Shoreline Accessibility	Stream Safety	Land Use	Stream Use	Shoreline Habitat	
41	14th Street and Kansas Avenue	Armourdale	Kansas River	4	2	1	2	4	13
42	12th Street and Kansas Avenue	Armourdale	Kansas River	4	2	1	2	4	13
43	Mill Street and Cheyenne Avenue	Armourdale	Kansas River	4	2	1	2	4	13
44	Northeast of Interstate 70 and Central Avenue	Splitlog Creek	Kansas River	3	2	1	2	4	12
47	South 14th Street, North of Ruby Avenue	Argentine	Kansas River	4	2	1	2	4	13
48	Strong Avenue Flood PS	Argentine	Kansas River	4	2	1	2	4	13
51	Grandview Boulevard and Park Drive	Mattoon Creek	Mattoon Creek	5	5	4	2	5	21
52	Grandview Boulevard and Riverview	Mattoon Creek	Mattoon Creek	4	5	3	2	5	19
53	4th Street North of Jersey Creek	Jersey Creek	Jersey Creek	2	2	3	1	1	9
54	North of Fairfax Drainage District PS	FID	Missouri River	2	2	1	1	1	7
55	10th Street and Walker Avenue	Jersey Creek	Jersey Creek	2	1	5	1	1	10
56	North of Viewcrest Drive	FID	Missouri River	3	3	3	1	2	12
62	18th Street and Troup Avenue	Jersey Creek	Jersey Creek	2	1	3	1	1	8

CSO Diversion ID	Diversion Structure Location	Basin	Receiving Water	Criteria Score					Total Score
				Shoreline Accessibility	Stream Safety	Land Use	Stream Use	Shoreline Habitat	
64	Interstate 70 at 22nd Street	Muncie Bluff Creek	Kansas River	1	4	1	1	2	9
65	2nd Street and Minnesota Avenue	Jersey Creek	Jersey Creek	3	2	1	2	4	12
66	Mill Street and Pawnee Avenue	Armourdale	Kansas River	4	2	1	2	4	13
80	3rd Street and New Jersey Avenue	Jersey Creek	Jersey Creek	2	2	3	1	1	9
81	10th Street and Troup Avenue	Jersey Creek	Jersey Creek	5	3	5	2	1	16
84	3rd Street and Walker	Jersey Creek	Jersey Creek	2	2	3	1	1	9
85	8th Street and Walker	Jersey Creek	Jersey Creek	5	3	5	2	1	16
86	1620 Fairfax	Jersey Creek	Jersey Creek	2	2	1	1	1	7

Note: Non-consecutive CSO Diversion ID numbers reflect the fact that the UG has eliminated CSO discharges, where possible, over the years.

The result of the priority area assessment shows that the majority of the UG CSO outfalls are located in areas that are relatively inaccessible and are not utilized extensively for recreation activities involving body contact with the streams. Most of the outfalls along Jersey Creek discharge to underground culverts or to sloped concrete lined channels or vertical channel walls. Velocities along Jersey Creek are also dangerous during wet weather due to the concrete lining of the channel. The disturbed nature of the concrete-lined Jersey Creek channel also does not provide natural habitat for aquatic species.

Several Jersey Creek outfalls fell within the medium priority rating. The medium priority outfalls are located along sections of the creek that have flatter side slopes and concrete lining that does not extend as high up the bank. Many of the medium priority outfalls also get higher ratings due to being located near park areas where the public can access the creek.

Of the six outfalls in the Esplanade Basin, three were considered medium priority. These three are located along a man-made drainage ditch, which is relatively shallow and accessible. The drainage ditch is along a railroad and industrial area and also near a residential area.

The primary CSO outfall to the Missouri River, CSO 54, is considered low priority due to difficult accessibility, adjacent industrial land use, and stream use consisting primarily of non-body contact recreational uses such as boating and shoreline fishing. Several Kansas River outfalls are medium priority rating generally due to their easier shoreline accessibility and more natural shoreline habitat versus the Missouri River.

The highest priority ratings occurred on the two Mattoon Creek outfalls. These outfalls had higher ratings due to the natural nature of the creek, comparatively high and safe stream accessibility, and natural shoreline habitat. The Mattoon Creek outfalls; however, overflow infrequently and are of very low annual volume.

Identification signs are located at all CSO locations (including the Mattoon Creek CSO outfall locations) and selected boat ramps and river access points close to CSO outfalls. In accordance with the NMC Plan, verification that these signs are in place and in good condition is performed at least annually. In addition to providing the CSO number, the signs state: "*These waters receive combined sewer overflows during rain events. Avoid contact. For information contact Water Pollution Control Unified Government 573-5535.*"

Considerations have been made in the Recommended Plan to further evaluate the higher priority CSO outfalls and provide enhanced access control and notifications if needed at outfall locations throughout the CSS.

2.9 I/I Reduction Demonstration

In 2013, the UG initiated an I/I reduction demonstration project in the Mill Creek and Brenner Heights Basins to gather information specific to their SSS and apply various rehabilitation techniques for guidance of future, system-wide I/I reduction. Initial outcomes of this effort resulted in forecasted planning level I/I reduction rates and costs that were used in the SSO control alternatives development and analysis.

Post-construction flow monitoring was initiated after rehabilitation construction and was completed in June 2015 at the same locations as the pre-construction monitoring. Control basins where no rehabilitation was performed were also monitored to partially account for changes in antecedent moisture conditions between the two monitoring periods.

Flow monitoring results were used to make comparisons between pre- and post-construction I/I rates and volumes. Measured I/I removal rates were lower than anticipated and in some cases inconclusive. These final results were used to modify the forecasted achievable rates and estimated costs of I/I reduction that were used in the development of this IOCP.

Regardless of the amount of I/I removed as a result of the demonstration project, a significant amount of SSS infrastructure renewal occurred in these basins. Infrastructure renewal is an integrated priority of the UG and this effort reinforces their commitment to upgrade and repair their sewer infrastructure and lessen discharges from their sewer system.

2.10 Early Action Projects and Programs

Prior to the PCD, the KDHE issued a NPDES Permit to the UG in 1996 that required compliance with the *CSO Control Policy* and directed the submittal of a NMC Plan. The NMC Plan is a statement of adopted policies and procedures to provide demonstrable evidence that the UG is taking actions to comply with the nine minimum control requirements. The plan was submitted and approved by the KDHE in 1998 and has been subsequently updated.

To address overflows in the CSS, the UG was also required to prepare a draft CSO long-term control plan. The *CSO LTCP* identified between $62 million and $85 million worth of projects, including Kaw Point WWTP improvements, pump station capacity improvements, sewer separation in the Jersey Creek Basin, and transport and storage facilities. Several of the recommended projects have been constructed, including those projects listed in Table 2-30. Numerous infrastructure renewal and I/I reduction projects were also completed over this time period.

Table 2-30: Completed CSO Control Projects (2003 - 2014)

Project	Description	Basin	Affected CSO Diversion Structures
Nine Minimum Controls Implementation at the Kaw Point WWTP	Bar screen replacement in the headworks facility; installation of motor-actuated, computer-controlled outfall sluice gate. (Screens were replaced again in 2014.)	Central Industrial District	None
Northwest Jersey Creek Sewer Separation, Phase I – Contract I, CSO 12 Elimination	Sewer separation within an area roughly bound by Troup Avenue on the North, 17th Street on the East, Wood Avenue on the South, and 18th Street on the West.	Upper Jersey Creek, South	8, 12
Northwest Jersey Creek Sewer Separation, Phase I – Contract II, CSOs 9 and 79	Sewer separation near Washington Avenue and 32nd Street (this also eliminated an SSO) and near Wood Avenue and 26th Street.	Upper Jersey Creek, South	9, 79
Parallel Parkway, 9th Street to 17th Street	A new sanitary sewer was installed to replace an existing zigzag sewer, which facilitated the plugging of an overflow line to the storm sewer system.	Middle Jersey Creek, North	13, 18

Project	Description	Basin	Affected CSO Diversion Structures
Northwest Jersey Creek Sewer Separation, Phase II – Contract I, CSO 63 Elimination	Sewer separation within an area roughly bound by Longwood Avenue on the North, 18th Street on the East, Haskell Avenue on the South, and 21st Street on the West.	Upper Jersey Creek, North	63
Independent CSOs Sewer Separation, Phase 1 – Contract 1, CSOs 50 and 61	Sewer separation along Scott Avenue from 7th Street to St. Paul Street, then along St. Paul Street to Shawnee Avenue, then along Shawnee Avenue to 5th Street and along Shawnee Avenue extending one-half block East of Armourdale Parkway.	Armourdale	50, 61
Fairfax Industrial District (FID) Pump Station Improvements	Station was updated with new equipment, including bar screens, isolation gates, pump check valves, motor control center, and variable frequency drives, intended to reduce overflow volume at CSO 54.	Fairfax Industrial District	54
Armourdale Industrial District (AID) Pump Station Improvements	Station was updated with new equipment, including pump check valves, intended to reduce overflow volume at CSO 44 by retaining existing design capacity.	Armourdale	44
Northwest Jersey Creek Sewer Separation, Phase II – Contract II, CSO 67 Elimination	Sewer separation within an area roughly bounded by K-5 Highway on the North, 22nd Street on the East, Roswell Avenue on the South and 27th Street on the West.	Upper Jersey Creek, North	6, 67
18th and Interstate 70 (Fiest – Prescott Plaza), Phase I	This project involved the elimination of a CSO in conjunction with the commercial development project that went in along the East side of 18th Street just North of Interstate Highway 70.	Muncie Bluff	57
Middle Jersey Creek Sewer Separation	Green infrastructure demonstration project; removed storm flow from sanitary sewers one-half block East and West of 16th Street.	Middle Jersey Creek, North	26
Parallel Parkway, 5th Street to 9th Street	A new storm sewer was installed along Hallock Street as a receiving line for future storm drain lines that are to be installed to eliminate CSO 22.	Middle Jersey Creek, North	22
11th Street and Troup Avenue Emergency Overflow Elimination	The sanitary sewer emergency overflow line that served the Mt. Carmel Place apartment complex was intercepted and the flow was routed to CSO 81.	Middle Jersey Creek, North	82
Central Industrial District (CID) CSO Elimination, Phase II	Elimination of five CSO outfalls associated with the Central Avenue Interceptor Sewer. CSOs 36, 37, and 38 were eliminated by improvements made by Butler Building (2005).	Central Industrial District	35, 36, 37, 38, 68, 69, 83, 88

More recently, the UG has invested tens of millions of dollars to upgrade and repair their sewer infrastructure, reduce I/I, lessen discharges from the sewer systems, improve capacity at the Kaw Point WWTP, and reduce effluent bacteria loading from the Kaw Point WWTP by addition of an ultraviolet disinfection facility. In addition, subsequent to the PCD, the following CSOs were plugged or reclassified as storm sewer structures: 20, 33, 34, 36, 37, 38, 46, 68, 69, 82, 83, 87, and 88.

The UG WPCD has also been working to operate more efficiently and effectively, as evidenced by the development and implementation of a FOG Control Program and CMOM Program, for example. Recent accomplishments related to CSO and SSO reduction and infrastructure renewal are presented in the following periodic reports submitted to the EPA as required by the PCD:

- 2013 Annual Report (January 1 through December 31, 2013).
- 2014 Semi-Annual Report (January 1 through June 30, 2014).
- 2014 Annual Report (July 1 through December 31, 2014).
- 2015 Semi-Annual Report (January 1 through June 30, 2015).
- 2015 Annual Report (July 1 through December 31, 2015).
- 2016 Semi-Annual Report (January 1 through June 30, 2016).

3.0 INFRASTRUCTURE CONDITION ASSESSMENT

3.1 Introduction

Renewal of existing infrastructure is a key priority of internal and external stakeholders. Much of the sewer system infrastructure has been in service beyond its intended life and has been in operation well beyond industry standards for physical effective life. Renewal and upgrade of existing infrastructure to increase system reliability is a key component of the short- and long-term strategy to reduce overflows caused by system deficiencies and failures. System renewal will also reduce reactive maintenance and increase preventive maintenance necessary to improve performance.

To determine the magnitude of repair, renewal, and upgrade needs, the condition of the following wastewater infrastructure was evaluated:

- Gravity sewer system.
- WWTPs.
- Pump stations.

Whenever possible, cost estimates were based on the actual condition of assets, rather than industry standards for physical effective life that are typically based solely on the age and/or material of the asset. This condition-based approach resulted in a higher confidence level in the necessary renewal investments. If this analysis were only based on high-level industry standards for physical effective life, the estimated renewal costs would be much higher than those identified by this condition-based approach.

3.2 Gravity Sewer System Renewal Needs

The UG owns and operates approximately 800 miles of gravity sanitary sewer and force main pipes (both separate and combined), 300 miles of storm sewer pipe, and 19,000 manholes. The majority of the gravity sewer assets within the service area will be at or beyond the estimated physical effective life during a 20-year planning period. The replacement cost for these gravity sewer assets is estimated to be well over half a billion dollars. As this gravity sewer infrastructure continues to age, substantial investment in renewal will be required in order to keep these assets in service and reduce the risk of sanitary overflows or backups caused by gravity sewer asset failure.

3.2.1 Pipes

Historically, most pipe renewal efforts by the UG have been reactive in nature, i.e., repairs are made in response to a pipe that is failing or has failed. A more proactive renewal strategy is desired that focuses on identifying pipes that require renewal before they fail, and addressing them prior to failure through planned renewal efforts. Recent improvements to the IMS have facilitated better usage of data to inform collection system management decisions. For example, this has enabled the development of a data driven approach that utilizes closed circuit television (CCTV) inspection results to plan and prioritize system renewal efforts and project long-term renewal needs with a higher level of confidence.

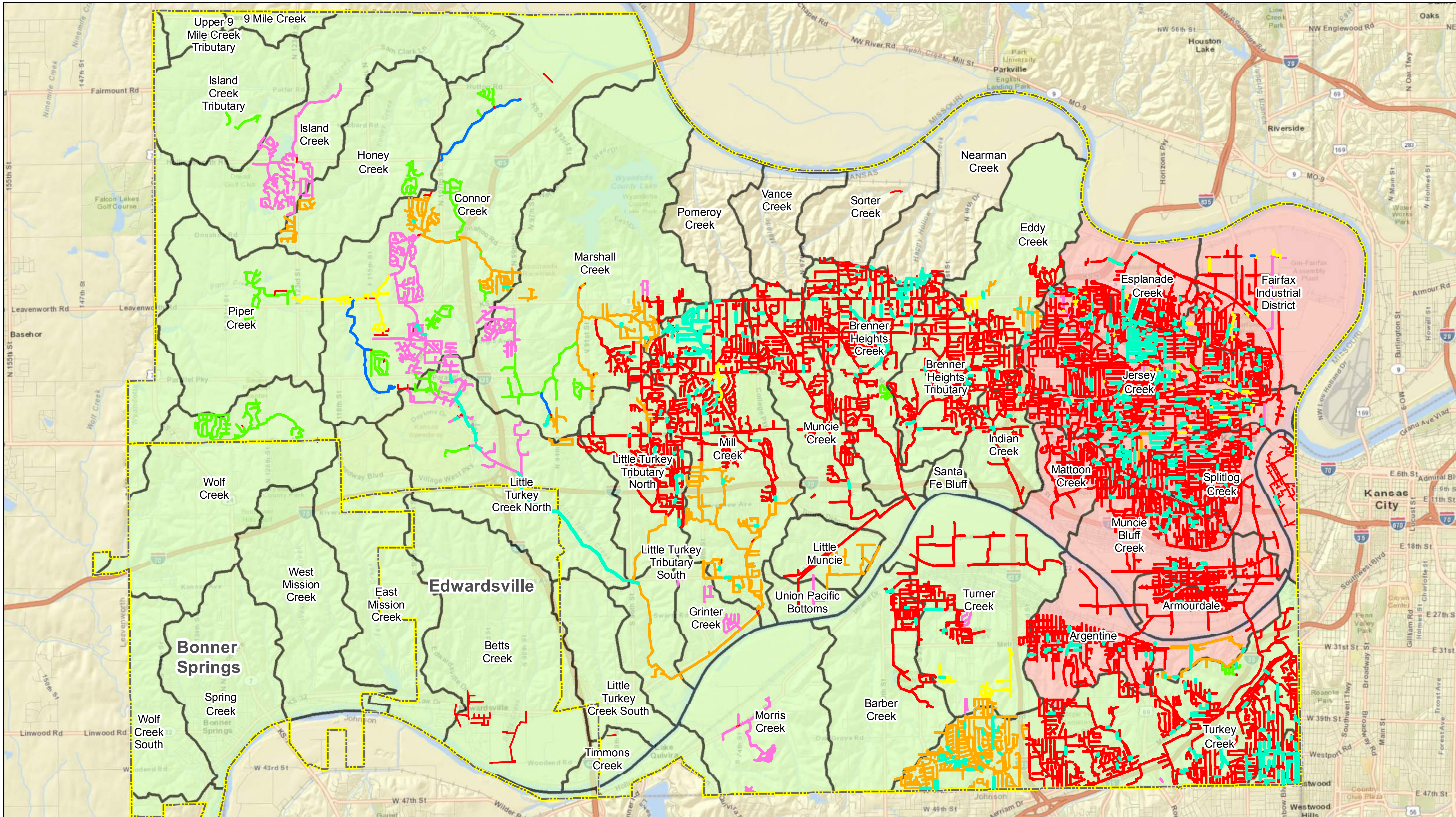
To form the basis of renewal cost estimates, an inventory of estimated ages for gravity sewer pipes was developed. For parts of the system, construction/installation dates were available in the existing GIS. However, much of the age data on pipes were not available. In these cases, installation dates were estimated using the following data sources:

- As-built records – used when available.
- Pump station construction dates – used to help estimate the age of upstream infrastructure.
- Plat data – used to estimate when specific developments and sewer infrastructure serving the developments were constructed.

Using this data, pipes were inventoried based on the estimated decade of installation as shown on Figure 3-1 and in Table 3-1.

Table 3-1: Gravity Sewer Pipe Installation Date Inventory

Estimated Installation Date	Pipe Length (miles)
1960s or Earlier	622
1970s	75
1980s	49
1990s	13
Post 2000s	42
Total	801



LEGEND

City Boundary

SSS

CIPP Lined Pipe 2004 - 2015

CSS

Estimated Installation Date

1960's or Earlier

1970 - 1979

1980 - 1989

1990 - 1999

2000 - 2009

2010 or Later

N

0 2 4 Miles

Data Sources: HDR Inc, ESRI
Coordinate System: NAD_1983_StatePlane_Kansas_North_FIPS_1501

Figure 3-1

Gravity Sewer Pipe Installation Date Map

As shown in Table 3-1, over 75% of the collection system was estimated to have been installed over 50 years ago. Of this 75%, much is believed to have been installed over 70 years ago, primarily in the CSS.

A condition-based approach was used to project the magnitude of system renewal needs using actual condition of sewer pipes based on existing CCTV records. At the time this analysis was conducted (Fall 2015), approximately 25% of the collection system has been televised within the past five years. A summary of the inspections completed by pipe material is shown in Table 3-2.

Table 3-2: CCTV Inspection Summary by Pipe Material

Pipe Material	Length Inspected (ft)	Percent of Pipe Length Inspected	Percent of Pipe Segments Inspected
Vitrified Clay Pipe (VCP)	727,826	30%	29%
Polyvinyl Chloride (PVC)	119,645	18%	21%
Unknown	109,591	18%	17%
Brick	17,234	20%	18%
Ductile Iron Pipe (DIP)	16,988	11%	17%
Reinforced Concrete Pipe (RCP)	14,451	10%	10%
Acrylonitrile Butadiene Styrene (ABS) Plastic	8,150	34%	36%
Reinforced Plastic (Truss)	7,898	49%	46%
Other	2,276	32%	32%
Polyethylene (PE)	2,083	100%	100%
Cast Iron Pipe (CIP)	1,947	4%	12%
Concrete (Non-Reinforced)	884	51%	46%
Corrugated Metal Pipe (CMP)	769	5%	5%
Segmented Block	199	100%	100%
High Density Polyethylene (HDPE)	21	0%	3%
Total	1,029,962	25%	24%

The inspection findings were coded per National Association of Sewer Service Companies (NASSCO) Pipeline Assessment Certification Program (PACP) standards and stored within the UG's Computerized Maintenance Management System (CMMS). This data was used as the basis for projecting the condition of pipes that have not been inspected since 2010. CCTV inspections completed prior to 2010 were not included in this analysis. This available data provided a strong basis for projecting the relative condition of the uninspected portions of the collection system.

A prioritization model was then used to characterize the condition of the inspected pipes and plan current and future system renewal needs. The prioritization model is used to calculate a Structural Risk Score (SRS) based on the actual condition assessment results (PACP coded observations) and consequence of failure factors. The scores range from 0 to 100, with higher scores representing greater structural risk, and are comprised of the individual probability and consequence of failure factors, summarized below:

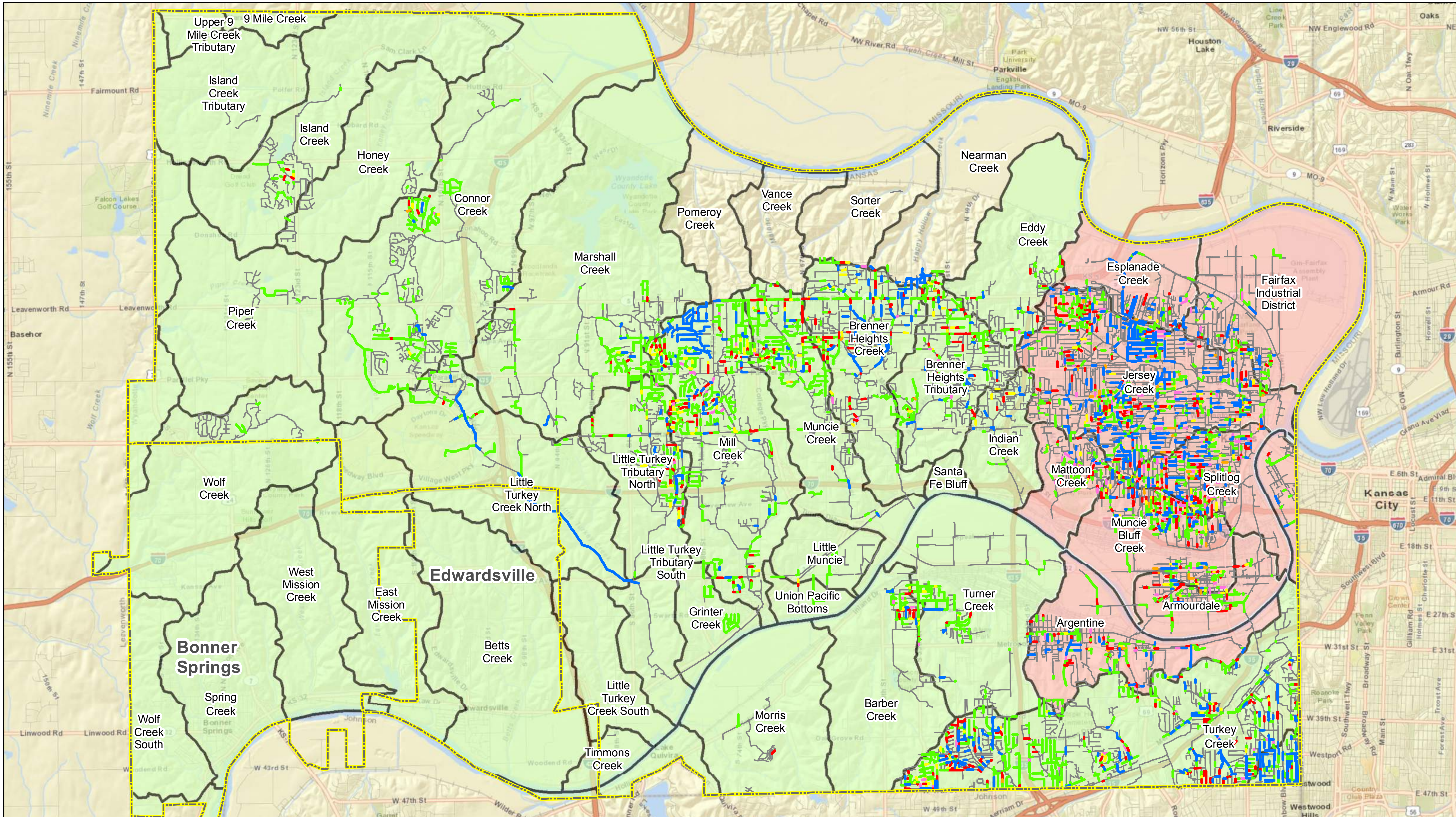
Probability of Failure factors (80% of SRS calculation):

- Defect type (e.g., hole, break, fracture) categorized based on severity and type.
- Defect size (e.g., clock position, length, percent blockage).
- Count of defects.
- O&M issues (e.g., roots, grease, debris).
- Anticipated deterioration rate (based on pipe material).
- Presence of groundwater.

Consequence of Failure factors (20% of SRS calculation):

- Land use in proximity of pipe (e.g., proximity to bodies of water, streets or major roadways, and railroads).
- Diameter.
- Depth.

The prioritization model was used to evaluate the CCTV inspection data collected between 2010 and October 2015. SRSs calculated by the prioritization model are presented on Figure 3-2 and summarized in Table 3-3.



LEGEND

City Boundary

SSS

CIPP Lined Pipe 2004 - 2015

CSS

Structural Risk Score (SRS)

***Calculated May, 2016**

60 or Greater

50 to 59

45 to 49

40 to 44

Below 40

No Recent CCTV No SRS Calculated

N

0 2 4 Miles

Data Sources: HDR Inc, ESRI

Coordinate System: NAD_1983_StatePlane_Kansas_North_FIPS_1501

Figure 3-2

Gravity Sewer Pipe Structural Risk Score Map

Table 3-3: Gravity Sewer Pipe Structural Risk Score Distribution

SRS Range	Percentage of Inspected Pipe Length[1]
Below 40	73%
40 to 44	5%
45 to 49	3%
50 to 59	2%
60 or Greater	17%

Note:
1. Pipe length refers to the length of pipe that has been inspected between 2010 and October 2015.

For the purposes of projecting renewal needs, it was assumed that pipes with a SRS of 45 or greater would require rehabilitation or repair. This SRS threshold was determined based on experience working with other utilities in the region, a comparison to scores on recent collection system renewal projects, and the I/I Removal Demonstration project results. Based on this threshold, over 20% of the system requires rehabilitation or repair.

The SRS results were then categorized by pipe age and material. The percentage of inspected pipes of each pipe material with a SRS of 45 or greater is tabulated in Table 3-4.

Table 3-4: Pipe Amount Projected to Require Renewal

Pipe Material	Percentage of Pipe Length **with SRS ≥ 45**
VCP	
Pre-1960s	31.2%
1960s and 1970s	21.6%
1980s and Later	1.5%
Plastic	4.4%
DIP	2.2%
Cast Iron	20.0%
Concrete	
Pre-1980s	9.1%
1980s and Later	4.4%
Brick	5.9%
CMP	30.0%
Unknown	
Pre-1960s[1]	25.4%
1960s and 1970s[1]	21.3%

Note:
1. Unknown pipe material believed to be primarily VCP.

The percentage of inspected pipes anticipated to require renewal in Table 3-4 was then extrapolated to the uninspected portions of the system to establish the total length of pipe projected to require renewal. The following assumptions were made regarding rehabilitation and repair methods:

- 90% of pipes requiring renewal were projected to be rehabilitated using cured-in-place pipe (CIPP) lining.
- 5% of pipes were projected to require point repairs (including both open cut excavation and trenchless repairs).
- 5% of pipes were projected to require replacement.

Unit costs for pipe rehabilitation and repair were developed based on recent UG renewal projects (projects bid in 2014 and 2015) and costs from other utilities in the Kansas City metropolitan area. Table 3-5 presents the unit costs used in this analysis for planned pipe renewal.

Table 3-5: Pipe Renewal Construction Unit Costs

Pipe Diameter (in)	Pipe Replacement (Open Cut Excavation) Cost ($ per ft)	Pipe Rehabilitation (Trenchless) Cost ($ per ft)
6	$120	$25
8	$127	$25
10	$135	$29
12	$145	$35
15	$150	$45
18	$162	$55
21	$181	$65
24	$185	$90
27	$190	$100
30	$200	$125
33	$220	$140
36	$240	$160
42	$270	$200
48	$310	$280
54	$360	$380
60	$430	$480
72	$540	$650
84	$560	$650
90	$600	$700
108	$710	$860
132	$870	$1,080
Point Repairs = $10,000 per repair		

The projected pipe renewal needs over the planning period are presented in Table 3-6. These costs include pipes that have been inspected in the past but have not yet been rehabilitated and the projected renewal needs for uninspected pipes as described above. Pipes that have already been rehabilitated and those included on current renewal projects were identified based on records in the CMMS. It was assumed that CIPP-lined pipes would maintain their structural integrity over the course of the planning period; thus, they are not included in projected renewal cost estimates.

Table 3-6: Projected Gravity Sewer Pipe Renewal Costs

Pipe Material	SSS[1]				CSS[1]				All Pipes
	Rehabilitation Cost	Replacement Cost	Point Repairs Cost	Total Estimated Cost (2015 $)	Rehabilitation Cost	Replacement Cost	Point Repairs Cost	Total Estimated Cost (2015 $)	Total Estimated Cost (2015 $)
VCP	$15,800,000	$3,900,000	$1,300,000	$21,000,000	$3,500,000	$500,000	$200,000	$4,200,000	$25,200,000
Plastic	$900,000	$200,000	$70,000	$1,170,000	$30,000	$200,000	$70,000	$300,000	$1,540,000
DIP	$300,000	$30,000	$8,000	$338,000	$50,000	$4,000	$1,000	$55,000	$360,000
Cast Iron	$600,000	$80,000	$20,000	$700,000	$200,000	$20,000	$3,000	$223,000	$950,000
Concrete	$400,000	$50,000	$10,000	$460,000	$2,200,000	$100,000	$20,000	$2,320,000	$2,880,000
Brick	$30,000	$3,000	$1,000	$34,000	$1,600,000	$90,000	$10,000	$1,700,000	$1,680,000
Unknown Material	$1,800,000	$400,000	$200,000	$2,400,000	$1,700,000	$100,000	$20,000	$1,820,000	$4,200,000
Corrugated Metal Pipe	$0	$0	$0	$0	$1,000,000	$70,000	$10,000	$1,080,000	$1,100,000
Subtotal	$19,830,000	$4,663,000	$1,609,000	$26,100,000	$10,280,000	$1,084,000	$334,000	$11,700,000	$37,800,000
Engineering, Legal, and Administration Costs (ELA) (25%)	–	–	–	$6,500,000	–	–	–	$2,900,000	$9,400,000
Subtotal, with ELA Costs				$31,600,000				$14,600,000	$46,200,000
Contingency Factor for Future System Degradation (10%)				$3,200,000				$1,500,000	$4,700,000
Total				$34,800,000				$16,100,000	$50,900,000
Deduction for Pipes Previously Rehabilitated or Included in Current Renewal Projects									$15,000,000
Total Projected Pipe Renewal Cost Over 25-Year Planning Period									$35,900,000

Notes

1. Categorized by service provided by the individual asset rather than service area.

3.2.2 Service Lateral Connections

Since 2014, the UG's collection system renewal strategy has included more aggressive repair of defective service lateral connections. These lateral connection repairs are considered a cost effective method of I/I reduction and prevention of blockages or collapses. The majority of these have been trenchless lateral repairs; however, some require excavation for repair.

Recent renewal projects (projects bid in 2014 and 2015) including over 1,000 lateral connection repairs were reviewed to establish an estimated unit cost of $2,500 per lateral connection repair. The projected quantity of future lateral connection repairs was estimated based on the ratio of completed lateral connection repairs to foot of pipe rehabilitated (approximately one repair per 125 feet of pipe rehabilitated). This rate of lateral connection repair was applied to the projected length of pipe (18-inch diameter or smaller) to be renewed during the planning period. The rate was not applied to larger diameter pipes since service lateral connections are not typically made to pipes with diameters above 18-inches. Estimated costs for the projected 4,095 lateral connection repairs over the planning period are presented in Table 3-7.

Table 3-7: Projected Service Lateral Connection Renewal Costs

Cost Item	Estimated Cost (2015 $)
Lateral Connection Repairs	$10,200,000
ELA Costs (25%)	$2,600,000
Subtotal, with ELA Costs	$12,800,000
Contingency Factor for Future System Degradation (10%)	$1,300,000
Total Projected Service Lateral Connection Renewal Cost Over 25-Year Planning Period	$14,100,000

3.2.3 Manholes

The PCD requires the UG to repair, rehabilitate, or replace at least 250 manholes per year, on a three-year rolling average. This rate of 250 manhole repairs per year was used to project manhole repair quantities over the 25-year planning period, resulting in the renewal of approximately 1/3 of the existing manholes within the UG's collection system over the next 25 years. Recent renewal projects were reviewed to establish an estimated unit cost of $1,500 per manhole repair. Estimated costs for the projected 6,250 manhole repairs over the planning period are presented in Table 3-8.

Table 3-8: Projected Manhole Renewal Costs

Cost Item	Estimated Cost (2015 $)
Manhole Repairs	$9,400,000
ELA Costs (25%)	$2,400,000
Total Projected Manhole Renewal Costs over 25-Year Planning Period	$11,800,000

3.2.4 Projected Renewal Costs

The total projected collection system renewal costs are presented in Table 3-9. This proactive system renewal, at an annual average cost of approximately $3 million, is anticipated to enable the UG to reduce the risk of sanitary overflows or backups caused by gravity sewer asset failure, extend the life of aging infrastructure and increase system reliability, and reduce I/I within the collection system.

Table 3-9: Projected Gravity Sewer System Renewal Costs

Gravity Sewer Need	System Asset				Annual Average Over 25-Year Period ($ Millions)
	Pipe Renewal ($ Millions)	Service Lateral Connection Renewal ($ Millions)	Manhole Renewal ($ Millions)	Total ($ Millions)	
Proactive Renewal	$35.9	$14.1	$11.8	$61.8	$2.5
Emergency Repairs	–	–	–	$7.5	$0.3
Totals	$35.9	$14.1	$11.8	$69.3	$2.8

3.3 Wastewater Treatment Plant Renewal Needs

The UG owns and operates five WWTPs. As these facilities continue to age, substantial investment in renewal will be required in order to keep these assets in service and reduce the risk of overflows and effluent limitation exceedances. Using information gathered from site visits and communicated by WWTP staff, Kaw Point WWTP and Plant 20 equipment was assessed and assigned a rating based upon its overall condition, reliability, and capacity. This assessment was used to develop a schedule for implementation of the recommended improvements and an opinion of probable costs associated with the phased improvements. A rating scale of 1 through 5 was utilized for each of these categories. Table 3-10 through Table 3-12 provide definitions for each of these ratings. These condition assessment findings will require further evaluation prior to additional prioritization and preliminary design efforts.

Table 3-10: WWTP Condition Rating Definitions

Condition Rating	Description	Percentage of Remaining Useful Life	Maintenance Benchmark
1	New or Excellent Condition	100%	Normal Preventive Maintenance
2	Minor Defects Only	75%	Normal Preventive Maintenance, Minor Corrective Maintenance
3	Moderate Deterioration	50%	Normal Preventive Maintenance, Major Corrective Maintenance
4	Significant Deterioration	25%	Rehabilitation, if possible
5	Virtually Unserviceable	1%	Replacement
U	Unknown	--	--

Table 3-11: WWTP Reliability Rating Definitions

Reliability Rating	Description	Failure Timing
1	Failure Not Anticipated	No known failures
2	Random Breakdown	Every 10 years
3	Occasional Breakdown	Every 5 years
4	Periodic Breakdown	Every 2 years
5	Continuous Breakdown	At least once/year

Table 3-12: WWTP Capacity Rating Definitions

Capacity Rating[1]	Description
1	Exceeds required capacity
2	Meets required capacity
3	Minor capacity and/or performance issues
4	Significant capacity deficiencies
5	Out of service

Notes:

1. Capacity evaluated relative to existing peak flow capacity of 48 mgd and 14 mgd for the Kaw Point WWTP and Plant 20, respectively.

3.3.1 Kaw Point WWTP

In December 2015, a condition assessment of the Kaw Point WWTP was conducted to identify necessary improvements based on equipment condition, reliability, and capacity. Results of the Kaw Point WWTP condition assessment are provided in Appendix B. The identified short-term renewal needs for the WWTP are listed in Table 3-13 along with associated estimated costs in Table 3-14.

Table 3-13: Kaw Point WWTP Identified Renewal Needs

Process, Structure, or Equipment	Within 5 Years	Within 10 Years
General Plant		
Sitework	• Investigate potable water system conforms to public health standards. Create drawing/schematic of system and include addition of new backflow preventers. • Security System Improvements. Work to include: 1. New Control Center relocated to the front of the plant (300 sf brick/block structure). 2. Control Center to include plant process monitoring as well as gate control and monitoring of security camera (two control stations and five cameras). 3. Update perimeter fencing and add gate controls that prevent unauthorized access. 4. Replace in-plant phone system with paging speakers. 5. Rekey doors plant-wide (30 doors).	• None identified at this time.
Electrical	• Electrical System Upgrade. Include three areas of focus: 1. Arc Flash Study. 2. Primary Building Electrical Switchgear Replacement. 3. Digester Complex Electrical Upgrade. Replace deteriorated motor control centers (MCCs) (Unitrol MCCD1 and D1A) that are beyond useful life and pose safety hazard.	• None identified at this time.
Mechanical	• Perform plant-wide roof and heating, ventilation, and cooling (HVAC) assessment.	• None identified at this time.

Process, Structure, or Equipment	Within 5 Years	Within 10 Years
Influent Junction Box	• Implement a weekly cleaning of the Influent Junction Box by the UG Vactor crew for a period of one year. Weekly cleaning should eliminate downstream greasebergs. During each cleaning, track the quantity and characteristics of the material removed.	• None identified at this time.
Primary Clarification and Pumping		
Clarifiers	• None identified at this time	• Remove ineffective primary clarifier corner sweeps and fillet the area to prevent solids from accumulating in the area. • Reseal the primary clarifiers.
Pumping	• Replace primary sludge pump with progressing cavity type.	• None identified at this time
Aeration Basins		
	• Evaluate dissolved oxygen (DO) probe location and replace units. • Add 4 intelligent electrical actuators to Oxidation Basin effluent piping valves to prevent personnel from having to climb on piping to change the valve position.	• Modify Oxidation Basin lower explosive limit (LEL) Structure to prevent temperature swings that impact the LEL sensor. Replace four LEL sensors with IR sensing technology that is not affected by temperature.
Secondary Clarification and Pumping		
Clarifiers	• Replace secondary clarifier scum skimmer flaps during annual inspection.	• Replace RAS riser suction tubes to provide better control over secondary sludge removal from the clarifiers. Replace with new spiral scraper sludge removal system. • Install new weirs and fully inboard concrete launder; remove/replace launder covers; adjust for hydraulic conditions.

Process, Structure, or Equipment	Within 5 Years	Within 10 Years
Headworks		
Screening and Grit Removal	• Add additional support to guardrail on discharge side of the screens. • Add collapsible curtain to the grit discharge chute to contain splatter that creates a slipping hazard. • Contact grit system manufacturer and have them perform an evaluation of the diffusers and blowers.	• Construct metal carport where the grit container storage containers can be protected from the weather.
General	• Replace the damaged guardrail and grating in the Primary Clarifier Building.	• None identified at this time.
Aerobic Digestion		
	• Contact elevator company and have them perform assessment and recommended maintenance (replacement) on elevator and controls.	• Modify the digesters to provide at grade manway access. • Repair digester liners and replace recirculation pumps with mixing system. Include new blending tank prior to centrifuge feed.

Table 3-14: Kaw Point WWTP Identified Renewal Costs

Process	Total Estimated Cost (2015 $)	Within Five Years	Within 10 Years
General Plant	$1,300,000	$1,300,000	--
Primary Clarification and Pumping	$1,000,000	$200,000	$800,000
Aeration Basins	$70,000	$50,000	$20,000
Secondary Clarification and Pumping	$2,700,000	$1,000	$2,700,000
Headworks	$70,000	$20,000	$50,000
Aerobic Digestion	$2,900,000	$1,000	$2,900,000
Total	$8,000,000	$1,600,000	$6,500,000
ELA Costs (25%)	$2,000,000	$400,000	$1,600,000
Subtotal after EAI	$10,000,000	$2,000,000	$8,100,000
Contingency (25%)	$2,500,000	$500,000	$2,000,000
Total	$12,600,000	$2,500,000	$10,100,000

3.3.2 Plant 20

In December 2015, a condition assessment of Plant 20 was conducted to identify necessary improvements based on equipment condition, reliability, and capacity needs. Results of the Plant 20 condition assessment are provided in Appendix C. The identified renewal needs for the WWTP are listed in Table 3-15 along with associated estimated costs in Table 3-16.

Table 3-15: Plant 20 Identified Renewal Needs

Process, Structure, or Equipment	Within 5 Years	Within 10 Years
Influent Screening and Grit Removal		
Screening	• Replace AquaGuard screen with new 6 mm perforated plate screen with washer/compactor. • Rehabilitate existing MEVA step screen and relocate to eastern channel. • New control enclosures for both screens. • Rehabilitate two western screening channels. • New screenings conveyor. • New isolation gates. • New makeup air units (MAUs) for screening room and pump room.	• None identified at this time.
Grit Removal	• New grit slurry pumps and associated control enclosures. • New grit vortex system. • New grit classifiers. • New enclosure for grit classifiers and dumpster. • New MAU for new grit enclosure.	• None identified at this time.
Primary Clarification and Pumping		
Clarifiers	• Spot repairs on weirs/baffles. • New scum pump manholes with new submersible pumps. • Replace scum pump valves in existing scum pit. • New primary sludge pumps and associated controls. • Sandblast/paint piping for primary sludge lines. Replace valves/piping as needed.	• New clarifier mechanisms and associated controls.

Process, Structure, or Equipment	Within 5 Years	Within 10 Years
Pumping	• New 6-inch primary sludge mag meter.	• None identified at this time.
Aeration Basins		
	• New blower intake plenum. • New air flow meters and air control valve actuators. • New human machine interface (HMI) for Turblex Blower.	• None identified at this time.
Secondary Clarification and Pumping		
Clarifiers	• New scum pump manholes with new submersible pumps. • Replacement of scum pump valves in existing scum pit.	• None identified at this time.
Pumping	• Sandblast/paint piping for RAS, waste activated sludge (WAS), and digested sludge lines. Replace valves/piping as needed. • New MAU for pump room and associated controls. • Rebuild WAS pumps. • New mag meters for RAS and WAS lines.	• New RAS pumps and associated controls.
UV Disinfection and Effluent Metering		
UV Disinfection	• New UV equipment and controls. • New adjacent structure for effluent serpentine weirs. Remove existing weighted gate. • New canopy UV structure and serpentine weir structure. • New crane.	• None identified at this time.
Effluent Metering	• New effluent mag meter. • Modifications to existing effluent metering structure.	• None identified at this time.

Process, Structure, or Equipment	Within 5 Years	Within 10 Years
Aerobic Digestion		
	• New aeration system. • New digested sludge pumps and mag meter. • New National Electrical Manufacturers Association (NEMA) 4X control enclosures. • New lighting and electrical raceway/ support components. • New mag meter for digested sludge.	• None identified at this time.
Solids Processing		
Primary Sludge Gravity Thickener	• New walkway. • New air release valve for effluent pipe. • Repairs to conduit and push buttons.	• New drive.
Belt Filter Press	• Rehabilitate existing belt filter press (BFP), procure key spare parts. • New MAU for press room.	• New two meter press and associated piping/controls. • Convert existing BFP to secondary press.
Filtrate Pumps	• Sandblast/paint piping for filtrate piping. Replace valves/piping as needed.	• None identified at this time.
Electrical Distribution		
	• Replace MCCs 1 through 5 and MCC 7. • Conduct a testing and conditioning assessment of the east and west utility transformers.	• None identified at this time.

Table 3-16: Plant 20 Identified Renewal Costs

Process	Total Estimated Cost (2015 $)	Within Five Years	Within 10 Years
Influent Screening and Grit Removal	$1,600,000	$1,600,000	$0
Primary Clarification and Pumping	$1,000,000	$500,000	$500,000
Aeration Basins	$70,000	$70,000	$0
Secondary Clarification and Pumping	$800,000	$500,000	$300,000
UV Disinfection and Effluent Metering	$1,700,000	$1,700,000	$0
Aerobic Digestion	$300,000	$300,000	$0
Solids Processing	$800,000	$200,000	$600,000
Electrical Distribution	$600,000	$600,000	$0
ELA (25%)	$1,700,000	$1,400,000	$400,000
Contingency (25%)	$2,200,000	$1,700,000	$400,000
Total	$10,800,000	$8,600,000	$2,200,000

3.3.3 Wolcott WWTP

The existing Wolcott WWTP will be replaced with a new wastewater treatment facility as a key early action project in the Recommended Plan. Therefore, a full condition assessment of the existing facility was not performed. However, a new RAS pump will be installed to improve wet weather operation until the new WWTP is completed.

3.3.4 WWTP 14

WWTP 14 is a small treatment facility that was recently upgraded in 2005. Facility renewal needs were reviewed with the UG operations staff and no major facility renewal needs beyond normal O&M activities were identified. As a result, a full condition assessment was not conducted at the facility. Renewal costs for the existing facility were estimated based on historical costs at the facility.

3.3.5 WWTP 3

WWTP 3 is a very small treatment facility. Facility renewal needs were reviewed with the UG operations staff and no major facility renewal needs beyond normal O&M activities were identified. As a result, a full condition assessment was not conducted at the facility. Renewal costs for the existing facility were estimated based on historical costs at the facility.

3.4 Pump Station Renewal Needs

The UG owns and operates many pump stations due to the breadth and topography of the service area. As these facilities continue to age, substantial investment in renewal will be required in order to keep these assets in service and reduce the risk of overflows. As required in the PCD, the UG inspected all SSS pump stations and developed recommended improvements for each. These pump stations were physically inspected to evaluate:

- General physical condition.
- Firm pump station capacity.
- Provisions for alternate power.

The evaluation of all 67 pump stations within the SSS were presented in two pump station reports submitted June 30, 2013, and June 30, 2014. These evaluations identified the major rehabilitation and repair needs at each of the pump stations. Pump stations within the CSS system were also evaluated as part of the CSS field investigations. Information from the pump station evaluations, operator information, and work orders were used to categorize each of the pump stations into one of three categories defined as follows:

- Category 1 - Pump stations in this category generally function as designed and constructed, and reliably convey peak dry weather flows. Their mechanical, structural, and electrical systems are in good condition. These pump stations may benefit from minor electrical, structural, or mechanical improvements. Pump stations in this category have the lowest priority for improvements.
- Category 2 - Pump stations in this category can convey peak dry weather flows with some minor improvements to enhance their reliability. These pump stations may be elevated to a Category 1 status with some electrical, structural, or mechanical improvements.
- Category 3 - Pump stations in this category are not reliably conveying peak dry weather flows due to electrical, structural, or mechanical deficiencies. Significant improvements are necessary to elevate the condition of these pump stations to a lower category rating. Pump stations in this category are considered the highest priority for improvements, meeting the criteria to be repaired or rehabilitated.

Each pump station was also assigned a level of importance from 1 to 3 where pump stations of critical importance were given a 1 and those of less importance given a 3. Pump station importance was evaluated based on the service area, pump station size, and consequence of failure.

Cost estimates were developed for each of the rehabilitation needs of each pump station. The pump station rehabilitation needs were also compared with those needs within the SSS to provide a two-year level of service. For example, if a pump station is in need of capacity upgrades to reach a two-year level of service and the pumps needed to be replaced for rehabilitation then those projects were combined into one project.

To determine a schedule of when pump station rehabilitation and repairs would occur, the pump station condition ratings and importance categories were utilized. Those pump stations with a rating of 3 (poor condition) and a category 1 (high importance) were scheduled to be rehabilitated within the first five years. Those pump stations with a rating of 3 and a category 2 and 3 were scheduled to be rehabilitated within years six through 10. The details regarding the pump station rehabilitation schedule is shown in Table 3-17.

Table 3-17: Pump Station Rehabilitation and Repair Schedule

Criteria	Year of Program				
	0-5	6-10	11-15	16-20	21-25
Condition Rating (1-3)	3	3	2	2	1
Importance Category (1-3)	1	2 & 3	1	2 & 3	1

Estimated costs for pump station renewal for each five-year term is shown in Table 3-18..

Table 3-18: Pump Station Renewal Costs and Schedule

	Year of Program				
	0-5	6-10	11-15	16-20	21-25
Total Estimated Cost (2015 $)	$9,400,000	$5,000,000	$5,000,000	$5,000,000	$5,000,000

3.5 Flood Control

The U.S. Army Corps of Engineers (USACE), Kansas City District, conducted the Kansas City, Missouri and Kansas, Flood Risk Management Project also known as the Seven Levee Study. This Seven Levees project was completed in conjunction with four non-federal sponsors including Kansas City, Missouri (prime sponsor), North Kansas City Levee District, Fairfax Drainage District (WyCo, Kansas), and Kaw Valley Drainage District (WyCo, Kansas). The purpose was to review the performance of the existing levee system in the Kansas City metropolitan area and to identify and implement alternatives to improve the levee performance and reliability.

The existing levee system consists of seven levee units along both banks of the Missouri and Kansas Rivers in the metropolitan area. An Interim Feasibility Study published in October 2006 contained recommendations for modifications and upgrades to the Argentine, Fairfax-Jersey Creek, North Kansas City, and East Bottoms Levee Units. A Final Feasibility Study was completed and published in 2014 containing recommendations for improvements in the Armourdale and Central Industrial District Units within the UG. The overall estimated improvement cost is approximately $313 million. The estimated local sponsor share for the project is almost $110 million for the UG. This $110 million local share would likely be split between Kaw Valley Drainage District, Fairfax Drainage District, and the UG. However, it is unlikely that the Fairfax Drainage District and Kaw Valley Drainage District could generate the revenue necessary to meet the non-federal sponsor match of $110 million for the Phase 2 improvements.

The current draft Water Resources Development Act (WRDA) of 2016 was passed by the Senate in September 2016 and has cleared committee in the House. The act has the Phase 2 improvements listed under the project name of *Armourdale and Central Industrial District Levee Units, Missouri River and Tributaries at Kansas City* at a total cost of $318,517,000 with $207,036,000 federal funding and $111,481,000 non-federal funding. If the current draft WRDA bill is signed into law as written, this project will move forward into design and construction. The design phase is estimated at three years with construction starting sometime between 2020 and 2023. Therefore, the financial impact to the UG to meet the non-federal sponsor match for this project could start as early as 2020.

In addition, it is estimated that the UG may have as much as 14,400 feet of gravity sewer, 5,100 feet of force mains, and over 120 utility structures that may need to be relocated as part of the proposed levee improvements. The relocation of utilities does not qualify for matching funding from the USACE resulting in an estimated $15 million in additional sewer improvements that are necessary along the levee.

3.6 Stream Crossings

A significant amount of the UG's SSS is installed such that it crosses under, over, or is in parallel alignment to streams. This infrastructure is vulnerable to failure due to stream meandering, channel down cutting, and bank erosion. These conditions can cause pipe, manhole or aerial sewer supports to become exposed. As a result, the pipe or manhole may shift, causing joints to open and sewage to escape to the stream as a SSO, or stream inflow or groundwater can be allowed to enter the SSS, which may overload the pipe capacity and cause a SSO downstream. Chronic stream inflow sources can also increase long-term O&M costs for treatment and pumping of the additional flow.

Recognizing this concern, the UG completed field inspection and documentation of sanitary sewer assets in close parallel proximity or crossing streams in 2013 and 2014. Nearly 78 miles of stream corridor were inspected in the following basins:

- Brenner Heights Creek.
- Brenner Heights Tributary.
- Island Creek.
- Jersey Creek/Eddy Creek (approximately 1 mile segment).
- Little Turkey Creek North.
- Little Turkey Tributary North.
- Little Turkey Tributary South.
- Mill Creek.
- Muncie Creek.
- Connor Creek.
- Honey Creek.
- Island Creek.
- Island Creek Tributary.
- Marshall Creek.

The inspection included 1,444 SSS assets in proximity to streams. Measurable criteria were collected from each located asset to allow prioritization based on risks of failure. The goal of the prioritization was to create a general ranking of evaluated assets into emergency, high, medium, or low priority for repair, maintenance, or monitoring.

Similar to the gravity sewer pipe renewal need projections, inspection results, investigation production rates, and rankings were used as a basis to estimate long-term budgetary costs for future mitigation work. These budgetary costs were then extrapolated to include the overall miles of stream corridor within Wyandotte County in proximity to sewer infrastructure. Inspection and repair costs over the 25-year planning period were estimated to determine budgetary yearly expenditures for stream crossing investigations and repairs. The initial high-level estimate for mitigation was determined to be approximately $500,000 per year. These estimates will be further refined over time based on additional investigation results.

4.0 REGULATORY NEEDS ASSESSMENT

4.1 Introduction

The scope of this IOCP is generally focused on wet weather issues and does not address all existing or future CWA regulatory needs. In addition to SSO and CSO control requirements, the UG faces a multitude of existing and future regulatory drivers that may result in significant investment beyond what is needed for the IOCP. The UG's capacity to address these additional drivers is severely limited in the near-term due to financial constraints, particularly with the capital and operational investments needed to implement the IOCP. The purpose of this section is to summarize those regulatory drivers that could potentially affect current and future NDPES permits for the UG wastewater treatment plants and the UG MS4 Permit. Information provided in this section is intended for planning and prioritization purposes.

Existing and future regulatory requirements discussed below include:

- Nutrient control regulatory programs.
- Revised ammonia criteria.
- Revised recreational use criteria.
- MS4 permit requirements.

4.2 Nutrient Control Regulatory Programs

The State of Kansas does not currently have numeric criteria for total phosphorus (TP) or total nitrogen (TN), but other nutrient-related programs represent significant potential drivers with respect to the UG's WWTPs. The primary nutrient regulatory programs affecting the UG are the 2004 Kansas Nutrient Reduction Plan and the forthcoming Kansas River TMDL for phosphorus. These nutrient-related drivers and their implications are discussed below.

4.2.1 2004 Kansas Nutrient Reduction Plan

The 2004 Kansas Nutrient Reduction Plan targets a 30% reduction in TN and TP throughout the state. To achieve this goal, the plan sets nutrient removal goals at all new plants and upgrades to major facilities (i.e., design capacity equal to or greater than 1 mgd). Based on expected removal efficiencies for biological nutrient removal (BNR), the plan targets effluent goals of 8 mg/L for TN and 1.5 mg/L for TP. However, the KDHE has more recently been accepting alternative effluent goals of 10 mg/L for TN and 1.0 mg/L for TP. The KDHE is also requiring existing major facilities to assess the feasibility of retrofitting for nutrient removal as NPDES permits are renewed.

4.2.2 Kansas River Phosphorus TMDL

The Kansas River is identified as impaired for phosphorus in the "2014 Kansas Integrated Water Quality Assessment" report; therefore, a TMDL is required to address this impairment. A TMDL is a pollutant budget that takes into account pollutant loadings from point and nonpoint sources that will result in use attainment. The KDHE has indicated that the draft Kansas River Phosphorus TMDL may be released in late 2016 or early 2017. The TMDL will likely include phosphorus wasteload allocations for both WWTP 14 and Plant 20, which both discharge to the Kansas River. The Wolcott WWTP and Kaw Point WWTP will not be impacted by the TMDL. However, planned expansion of the Wolcott WWTP and rerouting of flow from PS 50 should reduce nutrient loadings to Plant 20; and therefore, benefit the Kansas River.

Based on other TMDLs issued by the KDHE (e.g., Cow Creek and Big Creek), WWTP 14 and Plant 20 may receive phased TP limits once the Kansas River Phosphorus TMDL is completed. Final limits have yet to be determined, but consistent with other phosphorus TMDLs issued by the KDHE, Phase I and II TP limits may be 1.0 mg/L and 0.5 mg/L, respectively. Commensurate with these levels, the KDHE may expect upgrades to BNR after Phase I and enhanced nutrient removal (ENR) after Phase II if the impairment remains following Phase I. These nutrient reduction targets will be set through the TMDL process as dictated by the loading reductions needed to address the impairment and implementation strategies.

4.3 Revised Ammonia Criteria

In 2013, the EPA published updated national recommended water quality criteria from the effects of ammonia in freshwater. These new criteria recommendations were based on new toxicity data, which demonstrates that some organisms, particularly gill-breathing snails and freshwater mussels, are more sensitive to ammonia than other organisms in the national toxicity dataset used in previous criteria update recommendations. The revised ammonia criteria represent a significant reduction over the KDHE's current acute and chronic criteria. Depending on pH and temperature assumptions, acute and chronic criteria may drop as much as 50% or more. It is anticipated that the KDHE will adopt the EPA's 2013 ammonia criteria into rule sometime within the next 2 to 3 years.

The revised ammonia criteria will impact permit limits for the Wolcott WWTP and Plant 20. Due to receiving stream dilution and a lack of "reasonable potential," the Kaw Point WWTP and WWTP 14 will likely continue having monitoring only requirements. Planned expansion of the Wolcott WWTP has already taken into account the revised ammonia criteria, which will benefit the receiving stream, Connor Creek. Additionally, the planned expansion of the Wolcott WWTP will benefit Plant 20's ability to meet revised ammonia limits, as it will reduce overall flows and loadings to that WWTP.

4.4 Revised Recreational Use Criteria

The CWA, as amended by the Beaches Environmental Assessment and Coastal Health (BEACH) Act in 2000, requires the EPA to conduct studies associated with pathogens and human health and to publish new or revised recreational water quality criteria recommendations for pathogen indicators based on those studies. Kansas' existing recreational use criteria are based on the EPA's 1986 recommendations, which are rooted in epidemiological studies dating back to the 1940s and 1950s. Since this time, the EPA published updated recommendations in 2012 and is currently developing new coliphage criteria recommendations. If recreational criteria based on either set of recommendations are adopted by the State of Kansas, there may be significant implications with respect to disinfection requirements for the UG's WWTPs as described below.

4.4.1 New Bacteria Criteria

In 2012, the EPA updated the ambient water quality criteria recommendations for primary contact recreational waters. The revised recommendations include a 30-day geometric mean E. coli criterion of 126 CFU/100 mL and no longer allow for tiered primary recreational uses, which are currently designated for some streams in the UG's service area. Updates to the EPA's criteria also include recommendations for use of a statistical threshold value (STV) of 410 CFU/100 mL, which would not be exceeded more than 10% of the time over a 30-day period. If the 2012 EPA recommendations were adopted by the KDHE, the UG WWTPs may be required to achieve E. coli limits based on the recommended criterion and STV of 126 and 410 CFU/100 mL, respectively. The STV could potentially be applied as a maximum daily or weekly geometric mean. Impacts from the potential adoption of the EPA recommendations may be more significant to wet weather programs and MS4s than to publicly-owned treatment works (POTWs) due to the STV. However, the timing of adoption of these national recommendations within the Kansas program is uncertain. In particular, adoption of the primary contact recreation bacteria criteria recommendations would require Legislative action to amend state law.

4.4.2 New Coliphage Criteria

The EPA is currently considering the use of F-specific and somatic coliphages as possible indicators of fecal contamination in ambient water. There is some evidence to suggest that coliphages, which are a subset of bacteriophages (i.e., viruses that infect bacteria), are better indicators of human health risk than traditional fecal bacteria. Coliphage-based criteria may have operational implications for WWTPs as UV disinfection alone may not be sufficiently effective at typical dosage rates. This may lead to larger UV facilities, replacement, or coupling with other disinfection methods (e.g., chlorine). For example, current design of high-level disinfection reuse facilities in California require filtration and five-log removal of F-specific coliphages. The design of UV facilities at the UG was based on 2 to 2.5 log removal F-specific coliphages and specific water quality parameters. The impact of this rule is anticipated to be highly site-specific; therefore, additional evaluations at the time the rule is finalized will be necessary to better quantify the implications for each particular WWTP and may include bench-scale collimated beam testing and full-scale piloting.

Draft 304(a) ambient water quality criteria for coliphage were anticipated to be developed by the summer of 2017 by the EPA, but based on recent discussions with the agency this could be early 2018 with a final proposed rule issued sometime in the 2020-2021 timeframe. However, these targets are uncertain given the comments that will likely be raised by numerous organizations, permittees, and agencies. Adoption of the new criteria by the KDHE could take several more years because it would require Legislative action to amend state law.

4.5 MS4 Permit Requirements

On December 18, 2015, the KDHE issued the UG a new MS4 NPDES Permit effective January 1, 2016 (Kansas Permit No. M-MO25-SO01/Federal Permit No. KS0095656) that expires on December 31, 2019. The MS4 NPDES Permit requires the UG to:

- Report on the status of compliance with the permit conditions.
- Assess the appropriateness of the UG's best management practices (BMPs).
- Explain progress toward achieving measurable goals for each of the six minimum control measures (MCMs) as well as the statutory goal to reduce pollutants discharged from the MS4 to the maximum extent practicable (MEP).

The MS4 service area is comprised of those properties that discharge stormwater into the UG stormwater system. The service area does not include:

- Properties that are served by the UG's combined sewer system.
- Properties that discharge stormwater into stormwater conveyance systems pursuant to separately issued NPDES permits.
- Properties that discharge stormwater directly into local water bodies (direct dischargers).
- Properties located within the City of Bonner Springs, the City of Edwardsville, within Delaware Township (unincorporated, not within the urbanized area), or the City of Lake Quivira.

In 2012, the UG prepared and submitted a SMP to the EPA and the KDHE that was subsequently updated to address deficiencies identified by the EPA. The SMP was approved by the EPA on March 21, 2013. The SMP was further revised and an updated SMP was submitted on February 19, 2016. This revised 2016 SMP is considered the “effective SMP” that is being implemented by the UG to meet the current MS4 Permit.

The effective SMP includes standard operating procedures (SOPs) that are being implemented to reduce the discharge of pollutants from the MS4 to the MEP and other implementation measures to ensure compliance with the MS4 Permit. Per the permit, the UG shall revise the effective SMP by February 28, 2017, to address additional requirements. The effective SMP meets the following requirements:

1. Public Education and Outreach.
2. Public Involvement and Participation.
3. Illicit Discharge Detection and Elimination.
4. Construction Site Stormwater Runoff Control.
5. Post-Construction Stormwater Management Program.
6. Pollution Prevention/Good Housekeeping.
7. Industrial Activity Stormwater Runoff Management.
8. TMDL and Principal Pollutants of Concern BMPs.
9. Wet Weather Monitoring Program.
10. Stormwater Management Program Elements.

The effective SMP also requires minimum control and performance measures for the typical six MCMs plus four additional activity categories for a total of 10 listed activities as provided above. The additional four activity categories include addressing TMDLs and a Wet Weather Monitoring Program. The TMDL requirements including addressing Principal Pollutants of Concerns. The Wet Weather Monitoring Program requires the development and implementation of a program to monitor, collect, and analyze stormwater samples for wet weather events.

For each of these 10 categories, BMPs are defined along with measurable goals, responsible departments, compliance schedule, recurrence, and reporting requirements for each. The UG is currently in compliance with the required activities and reporting requirements as defined in the SMP. It is anticipated that the SMP will be updated in 2019 to meet the next five-year MS4 permit cycle from 2020-2025. At this time, it is unknown what additional MS4 permit requirements will be included in the next permit cycle. However, structural stormwater BMPs are anticipated to be required as part of the next MS4 permit, in part, to minimize the potential discharge of water containing high levels of fecal coliform from separate storm water discharges. The size and scale of structural BMPs that will be required are unknown, but it is the desire of the UG to integrate future MS4 structural BMP requirements with green infrastructure projects completed as part of the IOCP. Any changes to the MS4 Permit and/or the SMP will need to be coordinated with the IOCP to best address the overall water quality requirements for the service area.

4.6 Summary

The UG faces an evolving landscape of regulatory drivers in addition to the SSO and CSO control requirements. These current and future anticipated regulatory needs will exert additional financial pressures on the already stressed wastewater and stormwater utilities. As discussed in Section 9.0, the Recommended Plan does include investments to address some of these issues (e.g., Wolcott WWTP expansion and upgrade to meet new ammonia criteria and reduce Kansas River nutrient loading).

However, the capital and operational investments necessary to meet the remainder of these identified (and not currently identified) and anticipated future regulatory needs are not accounted for in the financial evaluation of the Recommended Plan. If compliance with future regulations that were not accounted for is required during implementation of the Recommended Plan or overall IOCP, the UG's financial capability to afford additional wet weather controls and investments will need to be carefully evaluated and regulatory priorities will need to be reviewed and reevaluated.

5.0 CSO LONG-TERM CONTROL PLAN

5.1 Introduction

Using the data and preliminary alternatives developed for the CSS characterization, CSO control plans were evaluated for several levels of overflow control identified in the PCD and *SSE Work Plan*. The plans take into account the past CSO control projects, predominantly consisting of sewer separation, performed as recommended in the *CSO LTCP*.

The CSO control plans are a refinement of the preliminary alternatives included in the *CSS Characterization Report*. Refinements included addressing input from the public and the UG staff and adding focus on CSO reduction strategies that provide the highest levels of system renewal and can alleviate other collection system issues such as street flooding, sewer backups, and dry weather overflows. The CSO control plans integrate control technologies into the most cost effective and locally acceptable list of projects that will attain the various levels of CSO reduction. The updated CSS hydraulic model, based on the 2015 flow monitoring and model calibration as detailed in the *CSS Characterization Report – Addendum No. 1*, was utilized to refine CSO control technology sizing and costs.

5.2 Preliminary CSS Alternatives

5.2.1 Preliminary Alternatives Analysis

The purpose of the preliminary alternatives analysis was to develop a suite of viable alternatives capable of achieving various levels of CSO control and identify relative costs of the alternative technologies. The data and alternatives developed generally consist of single CSO technologies applied basin-wide that provide actual reduction in CSO volume and/or frequency. Using this information, the IOCP integrates control technologies to provide the optimal plan for the community at a specified level of control.

The *UG Basis of Cost Manual* was used to develop the opinion of probable capital and O&M costs for each alternative. When capital cost equations were not available in the *UG Basis of Cost Manual*, other reference materials and previous experience were utilized. The conceptual level CSO control cost opinions during the preliminary alternative analysis were developed for alternative comparison, and do not include other significant wastewater-related costs such as SSO control, MS4 compliance, CMOM implementation, system renewal, and potential nutrient controls.

Each alternative technology was evaluated at various levels of control. Overflow frequencies of zero, one to three, four to seven, and eight to twelve were analyzed as well as analysis of the wet weather percent capture control levels at 100%, 90%, 85%, 80%, and 75%. The preliminary model runs were not intended to be used as specific alternatives for the IOCP, rather they were intended to narrow the field of CSO control technologies and provide respective costs of technologies. Alternative technologies were sized using continuous simulation over the Design Year hydrograph to account for back-to-back events.

For the preliminary analysis, each alternative control technology was applied across the entire CSS. For instance, the storage tank alternative used only storage tanks to reduce CSOs throughout the system versus integrating storage tanks at some locations and say, high-rate treatment in another location. This provided a comprehensive comparison of cost and feasibility of applying each control technology at common locations throughout the CSS.

5.2.2 Summary of Alternatives Analyzed in the *CSS Characterization Report*

The following control technologies were simulated with Design Year modeling across a range of control levels:

- Tank Storage with existing pumping conditions to the Kaw Point WWTP. This concept consisted of five CSO storage tanks strategically placed at CSOs 55, 54, 44, 43, and 48. Consolidation piping from other CSO diversion structures would bring additional overflow to the tank sites. Screening, grit removal, and odor control are included. Storage requirements were based on the existing hydraulic capacity of the Kaw Point WWTP and existing pump station wet-weather operational plans.
- Tank Storage with 95 mgd maximum pumping rate to the Kaw Point WWTP. This concept was identical to the previous tank storage alternative except that storage requirements were based on the full design capacities of the three CSS primary pump stations. The concept includes addition of 47 mgd of high rate treatment at the Kaw Point WWTP.
- Tunnel Storage. This concept included a deep-rock storage tunnel with drop shafts at CSOs 55, 54, 44, and 43. Consolidation piping from other CSO diversion structures brings flow to the drop shaft sites. Screening, grit removal, and odor control are included at the drop shaft sites. Sizing was based on the existing capacity of the Kaw Point WWTP. Stored flow would be pumped out of the tunnel to the AID Pump Station for transport to the Kaw Point WWTP.
- Full Overflow Conveyance with Kaw Point WWTP High Rate Treatment (HRT). This concept included increasing the capacities of the AID, FID, and CID Pump Stations to convey all overflow to the Kaw Point WWTP for each level of CSO control. Consolidation piping from the numerous CSO diversion structures would bring flow to the pump station locations. High rate treatment capacity was included at the Kaw Point WWTP based on the combined peak pumping capacities of the three CSS primary pump stations at the respective levels of control.
- In-Basin HRT. This concept consisted of providing satellite high rate treatment facilities at CSOs 54, 44, 43, and 48. Consolidation piping from other CSO diversion structures would bring additional wet weather flow to the HRT sites.

5.2.3 Isolated CSOs

Four diversion structures were not included in the CSO controls modeled. These diversion structures are located farther distances from the centralized control alternatives and do not overflow frequently or a substantial volume. Therefore, these diversion structures were considered outliers and individual improvements were identified to address CSO volume and frequency reduction. Below is a description of the isolated CSO locations and how they were addressed in the preliminary alternatives analysis.

- CSO 65 is located in the Jersey Creek Basin and is modeled to overflow three times during the Design Year. Accordingly, no controls are proposed for this outfall. If later monitoring (including post-construction monitoring) indicates higher overflow frequencies and/or volumes than the final performance measure(s) requires, there are a number of acres available for sewer separation in this area that will reduce overflows to the required frequency and/or volume.
- CSO 32 in the CID Basin is modeled to overflow one time during the Design Year. Accordingly, no controls are proposed for this outfall. If later monitoring (including post-construction monitoring) indicates higher overflow frequencies and/or volumes than the final performance measure(s) requires, there are a number of options available to achieve the final performance requirements.
- CSO 64 in the Muncie Bluff Creek Basin has been identified as having three overflows per Design Year. Accordingly, no controls are proposed for this outfall. If later monitoring (including post-

construction monitoring) indicates higher overflow frequencies and/or volumes than the final performance measure(s) requires, there are a number of acres available for sewer separation in this area that will reduce overflows to the required frequency and/or volume.

- CSO 51 in the Mattoon Creek Basin has been identified as having two overflows per Design Year. Therefore, no improvements were proposed for levels of control up to and including one to three overflows. Accordingly, no controls are proposed for this outfall. If later monitoring (including post-construction monitoring) indicates higher overflow frequencies and/or volumes than the final performance measure(s) requires, there are a number of acres available for sewer separation in this area that will reduce overflows to the required frequency and/or volume.

5.2.4 Design Year Performance

The alternatives were developed and sized utilizing a continuous simulation during a full representative year of rainfall. Design Year continuous simulation of the alternatives utilized the hyetograph described in Section 2.0 to determine annual overflow reduction by the modeled alternatives. This simulation can take into account back-to-back events that can affect sizing of alternatives, especially those that are storage related. Design Year modeling also provides data on the effectiveness of the alternative in reduction of annual overflow frequency and increase of annual percent capture of overflow in the typical year.

The effectiveness of the alternatives is based on the frequency of overflows and wet weather percent capture. Reducing the overflow frequency to the prescribed ranges tended to be the controlling factor in sizing the alternatives. Following is a list of approximate wet-weather capture percentages corresponding to the overflow frequency ranges modeled for the storage-based alternatives.

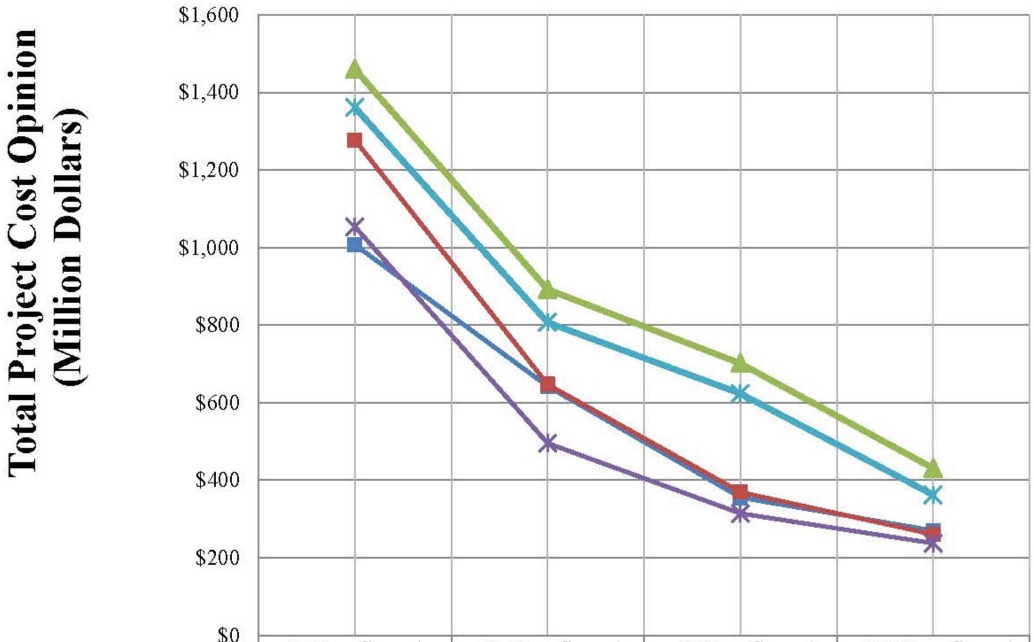
- Zero overflows per Design Year, corresponding to 100% capture of wet weather flows.
- Three or fewer overflows per Design Year, corresponding to more than 95% capture of wet weather flows.
- Seven or fewer overflows per Design Year, corresponding to more than 90% capture of wet weather flows.
- Twelve or fewer overflows per Design Year, corresponding to more than 85% capture of wet weather flows.

Generally, controlling CSOs to the specified annual frequency yielded significantly higher capture percentages than the corresponding capture listed above. This is due to the high peak flow rates and relatively short duration of the flow peaks simulated by the calibrated hydraulic model. When alternatives are sized for a peak flow rate to meet a given level of overflow frequency, the increased system capacity also provides more capture volume during the remaining larger events. A full description of the preliminary alternative analysis methodology and results can be found in the *CSS Characterization Report*.

5.2.5 Preliminary Alternatives Costs

A summary chart of the preliminary alternatives cost analysis is presented on Figure 5-1. In general, tunnel and tank storage alternatives provide the lowest costs for CSO control on a system-wide basis for the prescribed range of CSO volume and frequency control. The total project cost opinion for each improvement alternative was calculated by summing cost components of the initial capital costs and the present worth of annual O&M costs. Present worth of annual O&M costs was based on a 4% discount rate over a 50-year planning period (as documented in the *UG Basis of Cost Manual*).

Figure 5-1: Preliminary Basin CSO Control Alternatives Cost Summary



	0 Overflows/ Design Year	<3 Overflows/ Design Year	<7 Overflows/ Design Year	<12 Overflows/ Design Year
Storage Tanks (95 MGD to KPWWTP)	$1,007	$642	$355	$270
Storage Tanks (Existing flow to KPWWTP)	$1,277	$647	$369	$260
Storage Tunnel	$1,053	$495	$314	$237
Full Overflow Conveyance with Kaw Point WWTP HRT	$1,460	$892	$701	$431
In-Basin HRT	$1,361	$807	$623	$362

5.2.6 Preliminary Alternative Analysis Findings

The basin alternatives described below were evaluated based on achievement of varying levels of CSO control. For perspective, over 60% of the total overflow volumes occur at two CSO locations. CSO 54 (near the FID Pump Station) contributes 40% of the total volume while CSO 44 (near the AID Pump Station) contributes 21% of the total volume. At greater levels of CSO control, the sizing of control technologies becomes very large at these locations.

In the following sections, the general results of the preliminary alternatives analysis are discussed along with the relative feasibility of the CSO control technologies.

5.2.6.1 Sewer Separation

Full sewer separation is higher in cost and community disruption relative to the other CSO control alternatives. However, strategic sewer separation can relieve other underlying system issues such as basement backups and street flooding. Providing separation in areas prone to these problems will also reduce the size of other CSO controls. Localized sewer separation may also be employed at smaller, more remote CSO locations versus extending storage-based controls or adding conveyance capacity to an isolated location. Sewer separation has also been encouraged by the KDHE, especially when discharging to urban streams.

Despite these benefits, sewer separation does not eliminate pollutant discharges to receiving streams due to the pollutants from sources other than sanitary wastewater typically present in urban stormwater. Water quality sampling of separate UG stormwater discharges in 2013 supports this assertion. Thus, water quality benefits associated strictly with sewer separation tend to be lower than that obtained with “store and treat” or “convey and treat” technologies.

5.2.6.2 Green Infrastructure

Like sewer separation, green infrastructure is not recommended to be utilized as a stand-alone CSO control for the prescribed levels of control. Green infrastructure can be employed with similar objectives as stated for sewer separation where suitable sites for green infrastructure exist. If feasible, green infrastructure would also provide stormwater quality benefits that sewer separation alone cannot provide. Nevertheless, green infrastructure will be considered in all appropriate locations either as a stand-alone technology or to complement other controls.

5.2.6.3 Storage Technologies

Two separate store and treat technologies were evaluated to store CSO overflows during wet weather events and convey stored overflow to the WWTP as capacity becomes available. These alternatives were sized based on modeling with the Design Year hydrograph. Sizing was based on reducing frequency of overflow events at all diversion structures in the CSS to the level of control specified.

5.2.6.3.1 Storage Tanks

Construction of storage tanks is a feasible CSO control alternative for consideration. Two alternatives were analyzed for storage tanks. One was based on existing capacity of the Kaw Point WWTP and the other utilized the combined maximum primary pump station capacity of 95 mgd. In the 95 mgd alternative, high rate treatment would be added at the Kaw Point WWTP to increase the capacity to that of the combined primary pump stations.

The storage tanks were not the least costly of the alternatives analyzed. However, costs were near enough to other alternatives at the lower levels of CSO control that storage tanks are still considered viable due to the accuracy of the analysis at this conceptual level. At greater levels of CSO control, storage tank sizes become very large at CSO 54 and CSO 44 and the technology becomes less feasible due to finding suitable sites with sufficient land for the required storage.

5.2.6.3.2 Tunnel Storage

A storage tunnel alternative was analyzed to provide storage of CSS overflows over the entire study area. This alternative is a system wide solution and can only be mixed and matched with source control technologies such as sewer separation or green infrastructure.

At this conceptual level, tunnel storage was the least costly CSO control alternative analyzed for most levels of control. At less stringent levels of CSO control, tunnel costs are closer to other alternatives. However, with the exception of zero overflows per year, at the greater control levels tunnel storage becomes much more cost effective than the other technologies. Tunnels also have the advantage of requiring smaller footprints at CSO 54 and CSO 44 because tunnel drop shafts are much smaller than storage tanks. Therefore, sites near the FID and AID Pump Stations become more suitable when analyzed in conjunction with tunnel storage. Tunnels; however, have the disadvantage of the expenditure of large capital outlays in short periods. The other alternatives are more amenable to longer implementation and the potential for expansion.

5.2.6.4 Full Overflow Conveyance with Kaw Point WWTP HRT

This alternative is based on upsizing the FID and AID Pump Stations to convey peak flows simulated by the hydraulic model at the various levels of CSO control. Based on the modeling and pumping rates required, varying levels of high rate treatment would be required to treat the peak flow rates. The costs calculated include the cost to construct new larger pump stations, new wet weather force mains, and consolidation sewers to get overflows to FID and AID Pump Station locations, as well as the cost for HRT at Kaw Point WWTP.

Costs for the conveyance facilities themselves were much higher than the storage alternative costs. Costs at the twelve overflows per year level were reasonably close to the storage alternatives, however. This alternative provides a higher degree of system renewal than storage-based alternatives because new FID and AID Pump Stations and force mains would be constructed.

5.3 Integrated CSO Control Technologies

The findings of the preliminary alternative analysis were used to develop the most cost effective and locally beneficial alternatives for several levels of CSO control. The CSO control plans contained herein integrate multiple CSO control technologies to achieve a given level of overflow control. The levels of control are based on limiting overflow frequency to various levels, as well as a separate analysis geared toward achieving 85% wet weather capture.

5.3.1 Targeted Sewer Separation

Based on the UG staff and public input, areas where persistent street flooding occurs were identified. Areas in the central and western Armourdale Basin are the most notable of these street flooding-prone areas. Targeted sewer separation was proposed for these areas as a strategy to reduce street flooding, provide system renewal, and reduce CSO volume.

Sewer separation was also targeted in locations where CSO outfalls have high activation frequencies and are located in the upper reaches of the system. Most notable of these are CSO 47 in the Argentine Basin and CSOs 27 through 31 and CSO 56 in the Esplanade Basin. Sewer separation was seen as an effective strategy in these locations as a cost effective solution versus consolidating overflow downstream to centralized CSO control facilities. In addition, sewer separation cost in these areas is relatively inexpensive due to the low density of existing development dictated by topography and the prevalence of natural drainage ways.

A conceptual sewer separation layout was prepared and project capital costs estimated for each targeted sewer separation project. Capital costs were based on lineal footages and pipe diameters from the conceptual layouts with per foot costs and site adjustment factors as provided in the *UG Basis of Cost Manual*.

5.3.2 Targeted Green Infrastructure

Stormwater BMPs can be utilized to capture stormwater and reduce CSO volume within the CSS as well as reduce the size of gray infrastructure and provide stormwater quality benefits in the CSS. It is the UG's intent to utilize green infrastructure where feasible and cost effective as a CSO reduction strategy. Several sites have been identified and the intent is to employ an adaptive management approach to targeting additional sites within the CSS that may have the benefit of reducing the size of gray infrastructure. Initially constructed green infrastructure projects will be monitored post-construction to determine their effectiveness in reducing overflow volume compared to cost. This will help quantify green infrastructure feasibility relative to cost reductions in gray infrastructure.

One location where green infrastructure is targeted is within the CSO 19 watershed. There is currently a public/private redevelopment initiative within this watershed billed as the “Downtown Central Parkway Plan.” This plan includes new housing, opportunities for goods and services providers, a new YMCA building, as well as open space and pedestrian pathways to connect residential neighborhoods to the Central Parkway area. The concept provides several good opportunities to incorporate green infrastructure BMPs into the redevelopment plan. Initial modeling and cost estimating of the concepts suggests a savings of more than $7 million by instituting green infrastructure in the CSO 19 watershed, which results in a 2 mg reduction in the size of the storage tank downstream near the FID Pump Station.

The Downtown Central Parkway Plan area also includes the existing Big Eleven Lake. This lake receives minimal stormwater runoff and is predominantly spring-fed, with only an overflow outlet structure that connects to the CSS. Big Eleven Lake has suffered from water quality issues and in 1998 was listed as an impaired water body on the Kansas 303(d) list with a water quality impairment as eutrophication. The observed water quality issues have included algae blooms, objectionable concentrations of algae, and/or algal by-products. A TMDL was developed and approved in August 2001. The TMDL lists phosphorus as the limiting nutrient to improve water quality in Big Eleven Lake. For urban nonpoint source reduction, the TMDL suggests a 65.9% reduction in phosphorus. The proposed green infrastructure projects upstream of Big Eleven Lake will help meet the phosphorus reduction goals as required in the TMDL.

During public outreach activities, the UG received comments stating water quality in Big Eleven Lake was a community priority. The UG has developed a concept to incorporate localized sewer separation and green infrastructure into open spaces of the redevelopment plan both upstream and downstream of Big Eleven Lake. This concept is intended to meet the TMDL requirements for load reduction of phosphorus as well as reduce overflow volume and frequency at CSO 19 while improving a community amenity. The CSO 19 green infrastructure concept associated with the Downtown Central Parkway Plan is shown on Figure 5-2.

Legend

- Combined Sewer
- Sanitary Sewer
- Storm Sewer
- Stormwater Inlet

N

0 250 500 1,000 Feet

Figure 5-2

CSO 19 Green Infrastructure Potential Sites

Green infrastructure has also been targeted in the lower portion of the CSO 55 watershed as a solution to localized combined sewer capacity deficiencies and recurring street flooding. The CSO 55 green infrastructure sites could be developed as an alternative to the CSO 19 sites if the Downtown Central Parkway Plan is delayed. Other green infrastructure sites have also been identified including underutilized parks and vacant property. These alternative sites may be included as green infrastructure projects depending on the success of the completed projects and if other funding sources such as grants or private funding are identified to offset the cost.

5.3.3 CSS Pumping Capacity Increase to Maximize Flow to Kaw Point WWTP

A control strategy that has major impact on reducing overflow volume and on the percentage of wet weather flow captured within the CSS is increasing pumping rates from the three primary CSS pump stations that deliver flow to the Kaw Point WWTP. Increasing pumping rates captures more flow during the event and reduces the duration and volume of overflow at the two largest CSO diversions, CSO 54 (near FID Pump Station) and CSO 44 (near AID Pump Station). Pumping rate increases at AID Pump Station also reduce wet weather surcharging within the Armourdale interceptor sewer, significantly reducing overflow volume at CSO 43 in the Armourdale Basin and CSO 48 in the Argentine Basin.

Pump station capacity increases are practical only to a certain extent and at lower levels of control. While increased pumping rates have a significant impact on wet weather capture volume, it has a smaller impact on overflow frequency at CSO 54 and CSO 44. This again is due to the high, short duration peak flows in the system. To reduce overflow frequency to seven, three, or zero overflows per Design Year, pumping rates and associated force mains become very large, as do the interceptor sewers required to transport (i.e., consolidate) all flow to the pump station sites, and the high rate treatment facilities necessary to treat and disinfect the flow. This control strategy is; therefore, impractical to achieve very low overflow frequencies.

Presently, the combined design pumping capacity of the three primary CSS pump stations is 95 mgd. Due to limitations in force main capacity and capacity at the Kaw Point WWTP, 95 mgd cannot be pumped to the Kaw Point WWTP. The three pump stations are; therefore, actively controlled such that their combined pumping rate is limited to the Kaw Point WWTP capacity. During wet weather, preference is given to the AID and CID Pump Stations and the pumping rate at FID Pump Station is reduced. This is done to reduce overflow volume to the Kansas River as compared to the Missouri River and is in accordance with the UG wet weather operation procedures previously referenced.

Increasing pumping rates to the maximum pump station design capacity of 95 mgd will require force main capacity and reliability increases, as well as modifications to the Kaw Point WWTP. Force main improvements have the added benefit of system renewal and reliability enhancement to a critical system component. Modifications to the Kaw Point WWTP to provide high rate treatment capacity in the existing primary clarifiers is feasible up to 95 mgd, but not at higher flows. Due to these conditions, increasing pumping rates to a combined rate of approximately 95 mgd appears to be cost effective because existing pump station and treatment plant footprints are utilized. Increasing beyond 95 mgd would require new pump stations and additional treatment plant facilities to be constructed. For these reasons, the 95 mgd (approximate) pumping rate to the Kaw Point WWTP is a key part of the CSO control plans for lower levels of CSO control but is not included in the control plans for higher levels of control.

5.3.4 Capacity Improvements and High Rate Treatment at Kaw Point WWTP

Improvements to increase wet weather treatment at the Kaw Point WWTP were evaluated and documented in the *CSS Characterization Report*. The evaluation included treatment of wet weather flow of 95 mgd up to 382 mgd, which was intended to simulate full conveyance of all wet weather flow to the Kaw Point WWTP. The upstream sewer system has capacity to convey 95 mgd to the three primary pump stations; however, the upstream sewer capacity does not have capacity to convey 382 mgd. As mentioned previously, increasing influent pump station flows to the Kaw Point WWTP above the current design flow of 95 mgd would include extensive upgrades to FID and AID Pump Stations as well as significant force main improvements and gravity sewer improvements into the WWTP. The cost of these additional improvements is impractical. Accordingly, treating more than 95 mgd at the Kaw Point WWTP has been removed from consideration.

Three alternative technologies were evaluated to treat up to 95 mgd at the Kaw Point WWTP. These alternatives included Chemically Enhanced Settling (CES), Auxiliary High Rate Clarification (HRC), and Auxiliary High Rate Filtration (HRF). The evaluation of these three alternatives indicated that CES was the most cost effective alternative for high rate treatment.

CES will utilize the existing primary clarifiers with chemical addition to increase the settling capacity and allow for primary treatment of up to 95 mgd. The influent piping on the plant site will be adjusted to allow for the installation of a static overflow screen to increase the screening capacity to 95 mgd. The clarifier piping will also be adjusted to allow for wet weather flow above the secondary treatment capacity to Clarifiers 3 and 4. Clarifiers 1 and 2 will also include the addition of chemicals to allow for those two clarifiers to treat the increased flow. A chlorine contact basin will be constructed at the existing solids handling building to provide disinfection of the wet weather flow from Clarifiers 3 and 4. Once disinfected, the wet weather flow will be conveyed out of the Missouri River Primary Outfall.

5.4 CSO Control Plans

Separate CSO control plans were developed to limit overflow frequency at each outfall during the Design Year to less than or equal to 12 overflows, less than or equal to seven overflows, less than or equal to three overflows, and zero overflows. A fifth plan was developed to increase wet weather flow volume capture to a system-wide value of 85%. The modeled overflow reduction for the five alternatives are shown in Table 5-1. The specific projects and capital costs associated with each alternative are shown in Table 5-2 and discussed in the following sub-sections.

Table 5-1: Modeled Overflow Reduction of CSO LTCP Alternatives during the Design Year

Metric	Existing Conditions (2000)	Existing Conditions (2013)	**≤12** Overflow Events (Alternative A1)	**≤7 Overflow** Events (Alternative A2)	**≤3 Overflow** Events (Alternative A3)	0 Overflow Events (Alternative A4)	85% Wet Weather Capture (Alternative B)
Annual Overflow Frequency	44	44	12	7	3	0	44
Annual Overflow Volume (MG)	1,031	844	192	257	129	0	340
Percent Capture, Wet Weather Flow	69.2	70.5	93.1	90.2	95.1	100	85.3

Table 5-2: CSO LTCP Alternative Estimated Project Costs

Project	Basin	Affected CSO(s)	Affected Receiving Water	≤12 Overflow Events (Alternative A1)	≤7 Overflow Events (Alternative A2)	≤3 Overflow Events (Alternative A3)	0 Overflow Events (Alternative A4)	85% Wet Weather Capture (Alternative B)
CSO 19 Overflow Reduction (Green Infrastructure)	Jersey Creek	19, 54	Jersey Creek, Missouri River	$4,500,000	$4,500,000	$4,500,000	$4,500,000	$4,500,000
CSO 55 Overflow Reduction (Green Infrastructure/Sewer Separation)	Jersey Creek	19, 54	Jersey Creek, Missouri River	$5,900,000	$0	$0	$0	$5,900,000
CSO 47 Overflow Reduction (Sewer Separation)	Argentine	47, 48, 43, 44	Kansas River	$1,200,000	$1,200,000	$1,200,000	$1,200,000	$1,200,000
Esplanade Basin Overflow Reduction (Green Infrastructure/Sewer Separation)	Esplanade	27, 28, 29, 30, 31, 56, 54	Missouri River	$0	$0	$0	$0	$16,200,000
Armourdale Ph. 1 Sewer Separation (14th and Osage)	Armourdale	41, 42, 43, 44, 48	Kansas River	$1,100,000	$1,100,000	$1,100,000	$1,100,000	$1,100,000
Armourdale Ph. 2 Sewer Separation (Central Armourdale)	Armourdale	43, 44, 48	Kansas River	$5,300,000	$5,300,000	$5,300,000	$5,300,000	$5,300,000
Storage Tunnel (includes overflow reduction at isolated CSOs for Alternative A4)	All	All	Kansas River, Missouri River, Jersey Creek	$0	$243,900,000	$408,000,000	$912,700,000	$0
AID PS Downstream Sewer Capacity Improvements	AID Pump Station Basin	43, 44, 48, 39	Kansas River	$8,500,000	$0	$0	$0	$8,500,000
Consolidation Piping and Diversion Structure Improvements (AID Basin)	AID Pump Station Basin	All AID PS Basin CSOs	Kansas River	$4,400,000	$3,600,000	$7,700,000	$9,700,000	$0
AID Pump Station Storage Tank	AID Pump Station Basin	All AID PS CSOs	Kansas River	$31,500,000	$0	$0	$0	$0

Project	Basin	Affected CSO(s)	Affected Receiving Water	≤12 Overflow Events (Alternative A1)	**≤7 Overflow** Events (Alternative A2)	**≤3 Overflow** Events (Alternative A3)	0 Overflow Events (Alternative A4)	85% Wet Weather Capture (Alternative B)
FID PS Downstream Sewer Capacity Improvements	FID Pump Station Basin	All FID PS CSOs	Jersey Creek, Missouri River	$8,300,000	$0	$0	$0	$8,300,000
Consolidation Piping and Diversion Structure Improvements (FID Basin)	FID Pump Station Basin	All FID PS CSOs	Jersey Creek, Missouri River	$14,200,000	$15,500,000	$15,600,000	$19,500,000	$0
FID Pump Station Storage Tank	FID Pump Station Basin	All FID PS CSOs	Jersey Creek, Missouri River	$80,900,000	$0	$0	$0	$0
Argentine to Armourdale Siphon Restoration (Junction Box and Gates)	Argentine	48	Kansas River	$800,000	$800,000	$800,000	$800,000	$800,000
Kaw Point WWTP HRT (CES and Disinfection)	All Basins	All CSOs	Jersey Creek, Missouri River, Kansas River	$15,900,000	$0	$0	$0	$15,900,000
CSO 54 and CSO 86 Structural Improvements	FID Pump Station Basin	54, 86	Missouri River	$0	$0	$0	$0	$2,400,000
Total Estimated Cost (2015 $)				$182,500,000	$275,900,000	$444,200,000	$954,800,000	$70,100,000

5.4.1 12 Overflows or Less during Design Year (Alternative A1)

The plan to control overflows to 12 or less includes a mix of sewer separation and green infrastructure projects as well as additional CSO controls to reduce overflow frequency at the large high frequency discharge locations. The plan concept is to convey additional wet weather flow to CSOs 54 and 44 through interceptor capacity improvements to reduce overflows upstream in the system. Storage tanks are included at or near the CSO 54 and 44 diversion structures to reduce overflow frequency at these large volume and frequency overflow locations. The alternative assumed above ground storage tanks with flow pumped into the tanks and gravity flow out of the tanks. The tanks were sized to not overflow during the Design Year continuous simulation; therefore, all overflow occurs at the CSS diversion structures.

As shown in Table 5-1, this plan reduces overflow volume by 652 MG and achieves a wet weather capture of 93.1% during the Design Year. As shown on Figure 5-3, projects included in the plan for 12 overflows or less are as follows:

- CSO 19 Overflow Reduction (Green Infrastructure).
- CSO 47 Overflow Reduction (Sewer Separation).
- Armourdale Ph. 1 Sewer Separation (14th and Osage).
- Armourdale Ph. 2 Sewer Separation (Central Armourdale).
- AID PS Downstream Sewer Capacity Improvements.
- Consolidation Piping and Diversion Structure Improvements (AID Basin).
- AID Pump Station Storage Tank.
- FID PS Downstream Sewer Capacity Improvements.
- Consolidation Piping and Diversion Structure Improvements (FID Basin).
- FID Pump Station Storage Tank.
- Argentine to Armourdale Siphon Restoration.
- Kaw Point WWTP HRT.
- CSO 55 Overflow Reduction (Green Infrastructure).

As shown in Table 5-2, the total capital cost of Alternative A1 is $182,500,000 not including program management, public outreach, and post compliance monitoring.

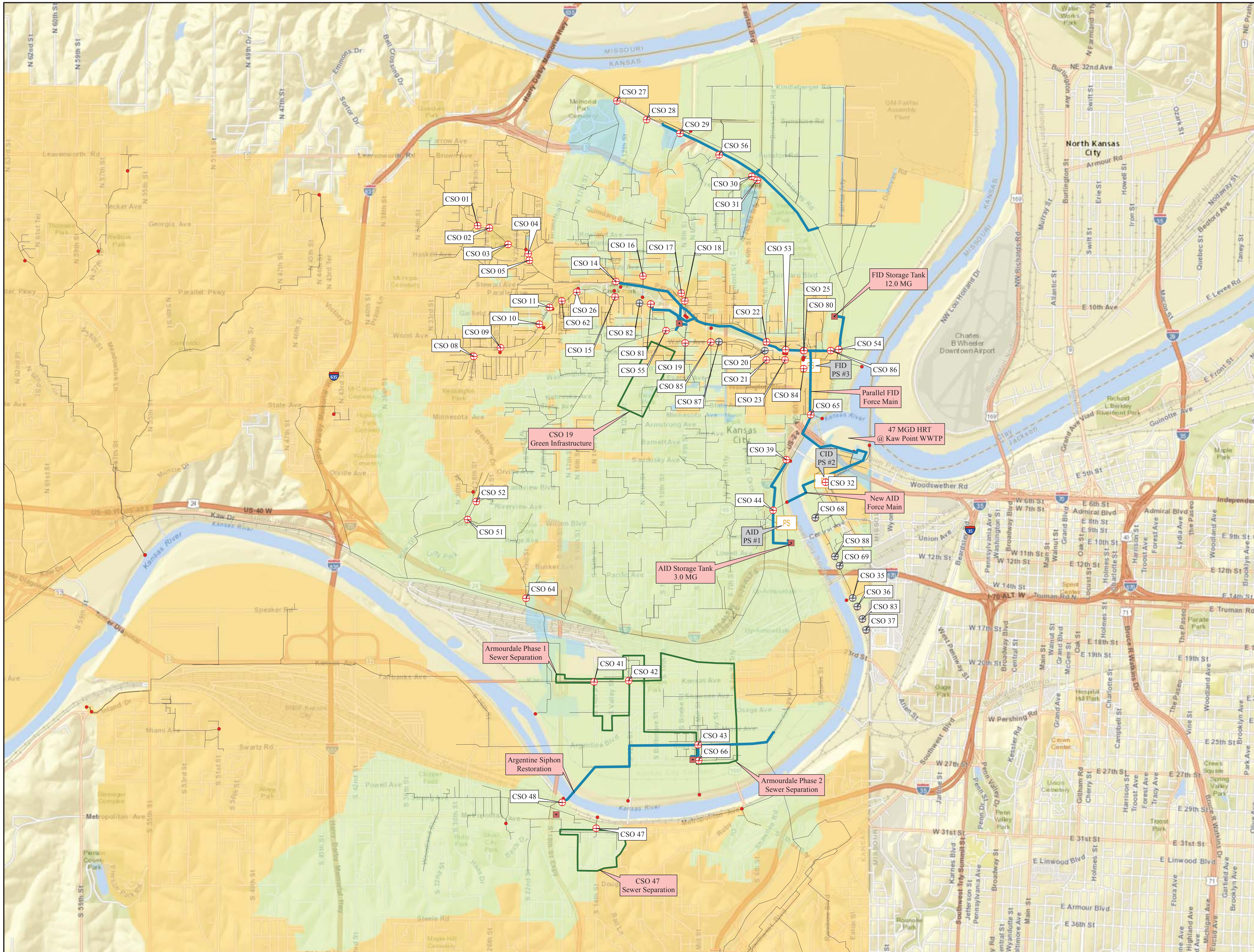


Figure 5-3
≤ 12 Overflow Events
(Alternative A1) Projects

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5.4.2 7 Overflows or Less during Design Year (Alternative A2)

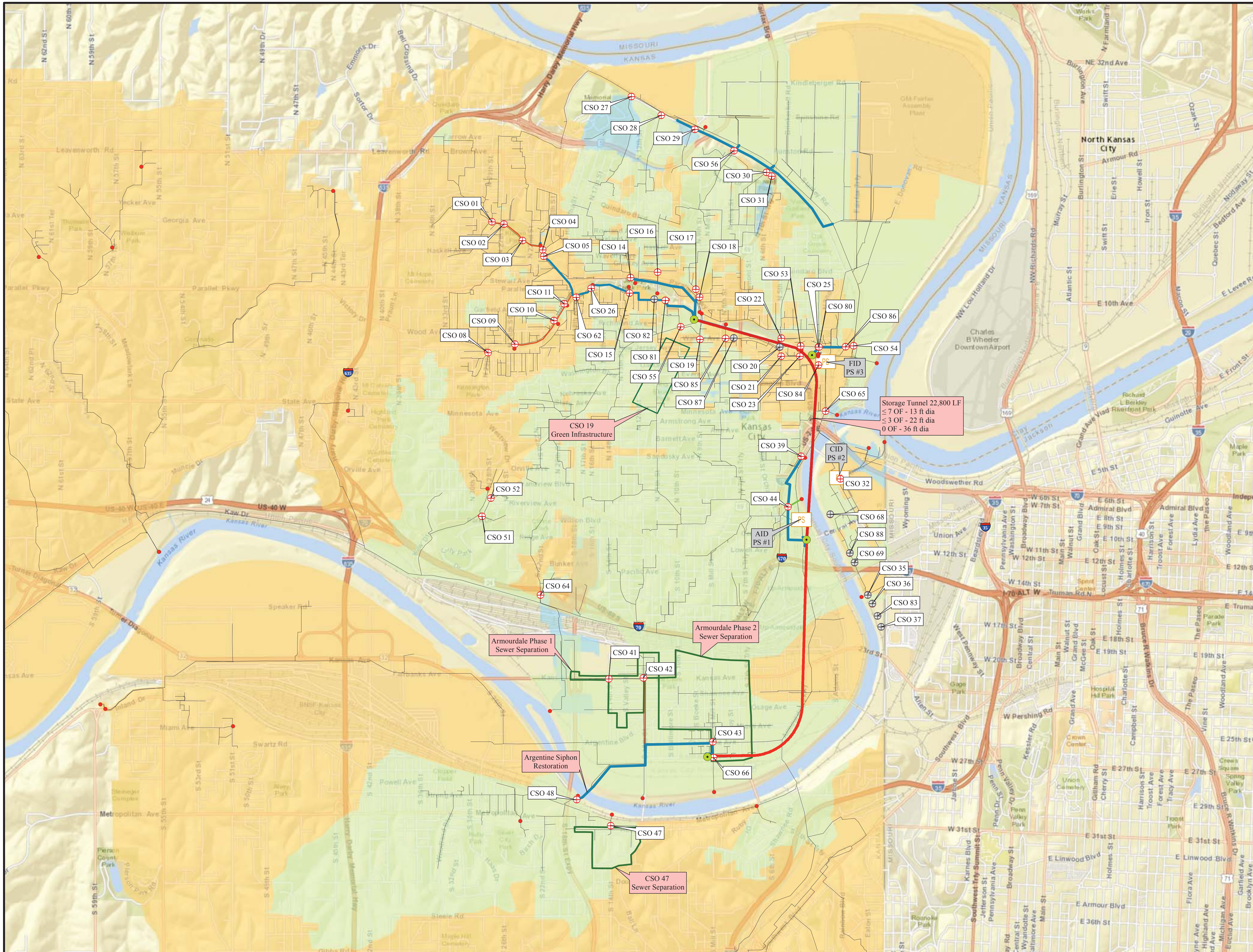
The plan to control overflows to seven or less includes several sewer separation and green infrastructure projects. Additional controls at this level of overflow frequency include construction of a deep CSO storage tunnel with dropshafts located strategically at the high frequency CSO locations near CSOs 55, 54, 44, and 43. Consolidation piping amounting to interceptor sewer capacity improvements would convey flow from other diversion structures, where overflow frequencies exceed seven per Design Year, to the drop shaft sites.

The tunnel was allowed to overflow to the CSO 54 outfall such that tunnel overflow occurred during concurrent events that produce overflow at the CSO 54 diversion structure. By doing this, the tunnel size and storage volume was optimized to meet the overflow frequency requirement. The resulting percent capture; however, was less than if the tunnel was not allowed to overflow and the only overflow occurred at the diversion structures. Allowing the tunnel to overflow for Alternative A2 actually resulted in more total CSO volume than in Alternative A1 where the storage tanks were not allowed to overflow.

As shown in Table 5-1, this plan reduces overflow volume by 587 MG and achieves a wet weather capture of 90.1% during the Design Year. As shown on Figure 5-4, the projects included in the plan for seven overflows or less are as follows:

- CSO 19 Overflow Reduction (Green Infrastructure).
- CSO 47 Overflow Reduction (Sewer Separation).
- Armourdale Ph. 1 Sewer Separation (14^{th} and Osage).
- Armourdale Ph. 2 Sewer Separation (Central Armourdale).
- Storage Tunnel (deep rock tunnel, 13 feet in diameter, 22,800 feet in length, including drop shafts, screening, grit removal, odor control, and dewatering pump station).
- Consolidation Piping and Diversion Structure Improvements (AID Basin).
- Consolidation Piping and Diversion Structure Improvements (FID Basin).
- Argentine to Armourdale Siphon Restoration.

As shown in Table 5-2, the total capital cost of Alternative A2 is $275,900,000 not including program management, public outreach, and post compliance monitoring.



0 1,250 2,500 5,000
Feet

Legend

- Drop Shafts
- Diversion Structure Plugged
- Diversion Structure
- Outfall
- PS Primary CSS Pump Stations
- Tunnel Alignment
- < 7 Overflow Consolidation Pipe
- < 3 Overflow Consolidation Pipe
- 0 Overflow Consolidation Pipe
- Modeled Pipes
- Sewer Separation Area
- Combined Sewer Area
- Sanitary Sewer Area
- Storm Sewer Area
- CSO 51 - CSO Designation

Figure 5-4
Tunnel Storage Alternatives
(Alternatives A2, A3, and A4) Projects

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5.4.3 3 Overflows or Less during Design Year (Alternative A3)

The plan to control overflows to three or less includes several sewer separation and green infrastructure projects. Additional controls at this level of overflow frequency include construction of a deep CSO storage tunnel with dropshafts located strategically at the high frequency CSO locations near CSOs 55, 54, 44, and 43. Consolidation piping amounting to interceptor sewer capacity improvements would convey flow from other diversion structures, where overflow frequencies exceed three per design year, to the drop shaft sites.

As with Alternative A2, the tunnel was allowed to overflow to the CSO 54 outfall such that tunnel overflow occurred during concurrent events that produce overflow at the CSO 54 diversion structure.

As shown in Table 5-1, this plan reduces overflow volume by 715 MG and achieves a wet weather capture of 95.1% during the Design Year. As shown on Figure 5-4, the projects included in the plan for 3 overflows or less are as follows:

- CSO 19 Overflow Reduction (Green Infrastructure).
- CSO 47 Overflow Reduction (Sewer Separation).
- Armourdale Ph. 1 Sewer Separation (14th and Osage).
- Armourdale Ph. 2 Sewer Separation (Central Armourdale).
- Storage Tunnel (deep rock tunnel, 22 feet in diameter, 22,800 feet in length, including drop shafts, screening, grit removal, odor control, and dewatering pump station).
- Consolidation Piping and Diversion Structure Improvements (AID Basin).
- Consolidation Piping and Diversion Structure Improvements (FID Basin).
- Argentine to Armourdale Siphon Restoration.

As shown in Table 5-2, the total capital cost of Alternative A3 is $444,200,000 not including program management, public outreach, and post compliance monitoring.

5.4.4 0 Overflows during Design Year (Alternative A4)

The plan to control to zero overflows includes several sewer separation and green infrastructure projects. Additional controls at this level of overflow frequency include construction of a deep CSO storage tunnel with dropshafts located strategically at the high frequency CSO locations near CSOs 55, 54, 44, and 43. Consolidation piping amounting to interceptor sewer capacity improvements would convey flow from other diversion structures, where overflow frequencies exceed zero per design year, to the drop shaft sites.

There are several isolated CSO locations in the upper reaches of the CSS that overflow infrequently and would only require controls if overflow events are to be reduced to zero. At these locations, consolidation to the tunnel drop shaft sites would be impractical. Sewer separation was assumed in these areas to eliminate CSOs for the Design Year.

As shown in Table 5-1, this plan reduces overflow volume by 844 MG and achieves a wet weather capture of 100% during the Design Year. As shown on Figure 5-4, projects included in the plan for 0 overflows are as follows:

- CSO 19 Overflow Reduction (Green Infrastructure).
- CSO 47 Overflow Reduction (Sewer Separation).
- Armourdale Ph. 1 Sewer Separation (14^{th} and Osage).
- Armourdale Ph. 2 Sewer Separation (Central Armourdale).

- Storage Tunnel (deep rock tunnel, 36 feet in diameter, 22,800 feet in length, including drop shafts, screening, grit removal, odor control, and dewatering pump station).
- Consolidation Piping and Diversion Structure Improvements (AID Basin).
- Consolidation Piping and Diversion Structure Improvements (FID Basin).
- Argentine to Armourdale Siphon Restoration.

Isolated CSO locations:

- CSO 65 (south Jersey Creek) sewer separation.
- CSO 51 and 52 (Mattoon Creek) sewer separation.
- CSO 64 (Muncie Bluff Creek) sewer separation.
- CSO 32 (Central Industrial District) sewer separation.

As shown in Table 5-2, the total capital cost of Alternative A4 is $954,800,000 not including program management, public outreach, and post compliance monitoring.

5.4.5 85% Wet Weather Capture during Design Year (Alternative B)

The CSO control plan to attain a system-wide wet weather capture ratio of 85% includes predominantly targeted sewer separation and green infrastructure, as well as increasing the pumping capacities of the CSS primary pump stations to their original design capabilities. This plan meets the presumptive approach by attaining capture volumes exceeding 85% of the wet weather flow volume during the Design Year on a system-wide basis across the CSS. This control plan also meets the demonstration approach.

As shown in Table 5-1, this plan reduces overflow volume by 504 mg and achieves a wet weather capture of 85.3% during the Design Year. As shown on Figure 5-5, projects included in the plan for 85% wet weather capture are as follows:

- CSO 19 Overflow Reduction (Green Infrastructure).
- CSO 55 Overflow Reduction (Green Infrastructure/Sewer Separation).
- CSO 47 Overflow Reduction (Sewer Separation).
- Esplanade Basin Overflow Reduction (Green Infrastructure/Sewer Separation).
- Armourdale Ph. 1 Sewer Separation (14th and Osage).
- Armourdale Ph. 2 Sewer Separation (Central Armourdale).
- AID PS Downstream Sewer Capacity Improvements.
- FID PS Downstream Sewer Capacity Improvements.
- Argentine to Armourdale Siphon Restoration.
- Kaw Point WWTP HRT.
- CSO 54 and CSO 86 Structural Improvements.

As shown in Table 5-2, the total capital cost of Alternative B is $67,700,000 not including program management, public outreach, and post compliance monitoring.

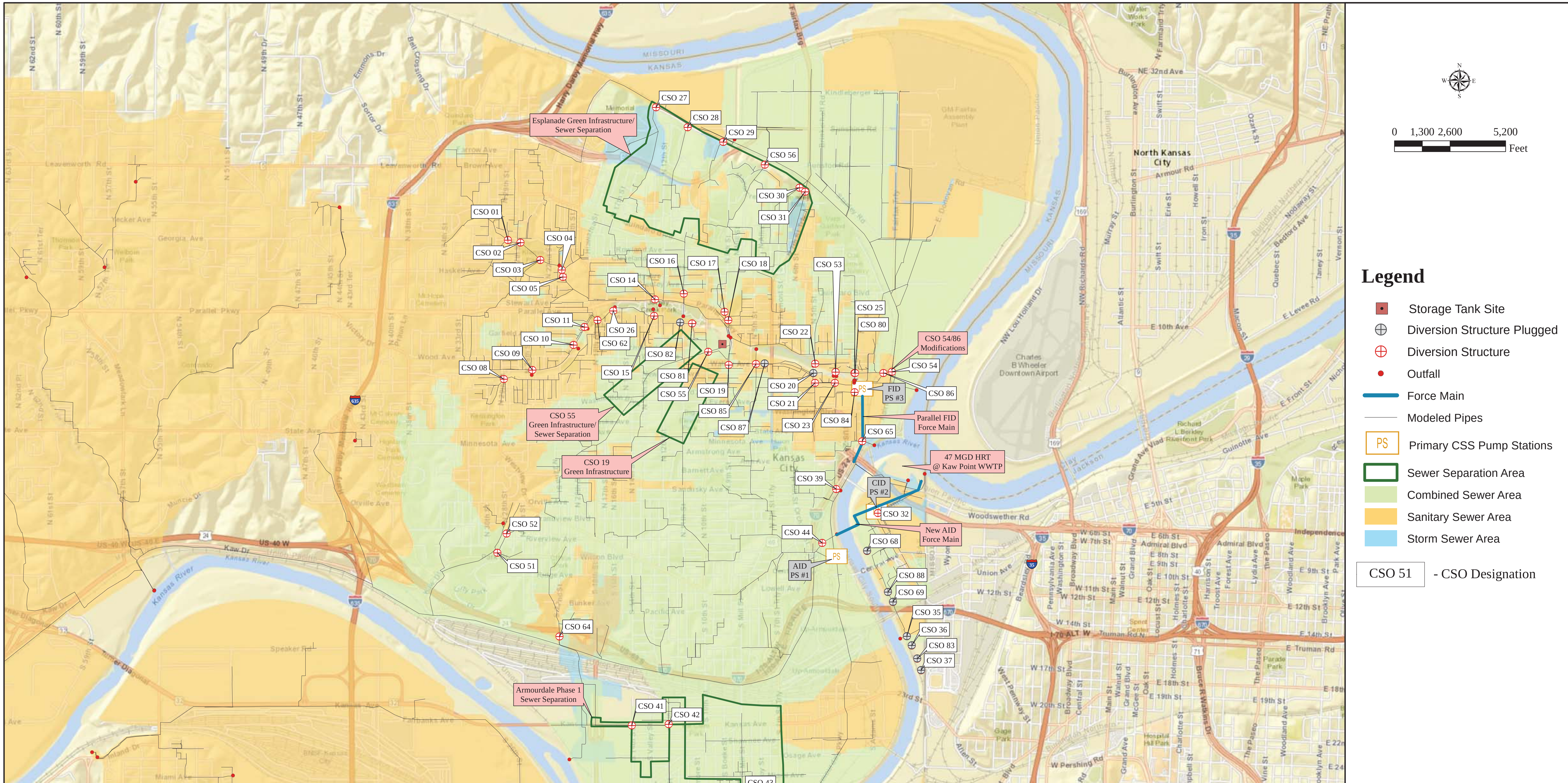

Figure 5-5
85% Wet Weather Capture
(Alternative B) Projects

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5.5 Water Quality Impacts

This section presents the results of water quality model applications to assess the water quality benefits of CSO control alternatives. Section 2.0 of this report presents a summary of the development of the water quality models as well as their application to represent existing conditions. The *CSS Characterization Report* presents detailed discussion of model development and calibration. Applicable water quality standards for the UG service area were presented previously.

This section first presents the results of the EFDC model applications to assess water quality benefits in the Kansas River and Missouri River. Next, the results of the spreadsheet models for Jersey Creek and Mattoon Creek are presented.

5.5.1 Evaluation of CSO Control Benefits to the Kansas River and Missouri River

The calibrated water quality model was configured to simulate scenarios and assess compliance with water quality criteria for E. coli during the Design Year recreation season (April-October). The applicable criterion is the Primary Contact Recreation – Class B water quality standard (262 CFUs/100 mL) for the Kansas and Missouri Rivers. In lieu of configuring model scenarios based on CSO control plans developed to achieve a range of overflow frequency reduction, three model scenarios were configured to provide a complete comparison of CSO control benefits:

- Existing Conditions.
- Proposed 10-Year CSO Improvement Plan. The projects comprising this scenario include those scheduled to occur in the first 10 years of CSO control projects in Alternatives A1 through A4 and B presented in Section 5.4. These projects scheduled to occur in the first 10 years are identical for all five (25-year) alternatives.
- Complete UG CSO Elimination. This scenario assumes that all UG CSO discharges are eliminated via sewer separation.

These scenarios also included planned improvements for the KCMO Turkey Creek CSO discharge as anticipated in the final alternative in KCMO's Overflow Control Plan (OCP). Other inputs remained the same as the existing conditions scenario, including separate stormwater and upstream boundary conditions.

5.5.1.1 Baseline Upstream Boundary Conditions

Three scenarios were simulated with the baseline upstream boundary conditions as follows:

- Baseline Existing Conditions:
  - Existing UG CSOs.
  - Existing KCMO Turkey Creek CSO.
  - Baseline upstream boundary conditions for the Kansas and Missouri Rivers.
  - Existing WWTP discharges from the Kaw Point WWTP and KCMO Westside WWTP.
- Baseline Upstream Boundary Conditions with Proposed 10-Year CSO Improvement Plan:
  - UG CSOs as improved under the proposed 10-year CSO improvement plan. Flows were reduced for specified CSOs; E. coli concentrations in the discharges remain the same as in existing conditions.

    - KCMO Turkey Creek CSO as proposed in the final alternative of the KCMO OCP. This included a reduction to 510 million gallons of overflow during the Design Year recreational season.
    - Baseline upstream boundary conditions for the Kansas and Missouri Rivers.
    - Kaw Point WWTP discharges as proposed in the 10-year CSO improvement plan and existing KCMO Westside WWTP discharges.
- Baseline Upstream Boundary Conditions with Complete UG CSO Elimination:
    - UG CSOs eliminated via separation. Discharge flows consistent with the proposed 10-year CSO improvement plan, but with E. coli concentrations in the discharges reduced to the separate stormwater event mean concentration of 8,051 CFUs/100 mL.
    - KCMO Turkey Creek CSO as proposed in the final alternative of the KCMO OCP.
    - Baseline upstream boundary conditions for the Kansas and Missouri Rivers.
    - Kaw Point WWTP discharges as proposed in the 10-year plan and existing KCMO Westside WWTP discharges.

The two-dimensional model results were processed to develop an average daily E. coli concentration and then calculate a monthly geomean for each lateral transect. Daily results within each reach of the river were also averaged for the Kansas River from the Interstate 635 bridge to the confluence with the Missouri River, and for the Missouri River from the Interstate 635 bridge to the state line. The daily reach averages were used to calculate a monthly geomean for each reach. Transects in the Kansas River and Missouri River EFDC model are two to four model grid cells across the rivers and average 85 meters in length upstream to downstream. Reducing the size of model segments or grid cell sizes is possible in multi-dimensional models to obtain very fine spatial resolution that would result in a greater range of simulated concentrations. For example, small grid cells along the riverbank at the location of a CSO discharge would have higher concentrations than a grid cell on the opposite side of the river. However, smaller grid cell sizes result in higher computational requirements. The reach and laterally averaged transect results in the Kansas River and Missouri River provide both a broad and fine spatial scale resolution to assess the water quality benefits of CSO controls.

The results on Figure 5-6 and Figure 5-7 show that under baseline existing conditions, the monthly geomean on a reach basis exceeds the applicable criterion of 262 CFUs/100 mL in four of the seven months of the recreation season in both the Kansas and Missouri Rivers. Figure 5-6 and Figure 5-7 also show that the reach monthly geomean values improve to only a small degree with the implementation of the proposed 10-year CSO improvement plan and that eliminating the UG CSOs provides little additional benefit.

Figure 5-6: Comparison of Reach Monthly Geomean Results for CSO Control Scenarios with Baseline Upstream Boundary Conditions in the Kansas River

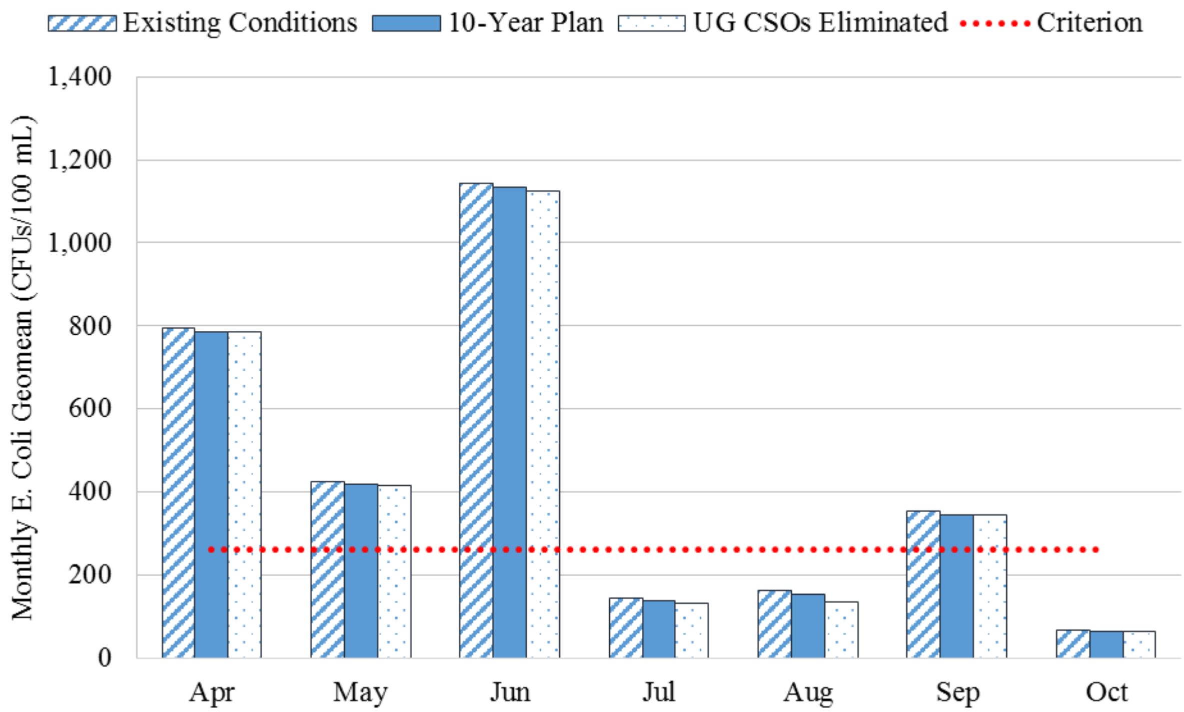
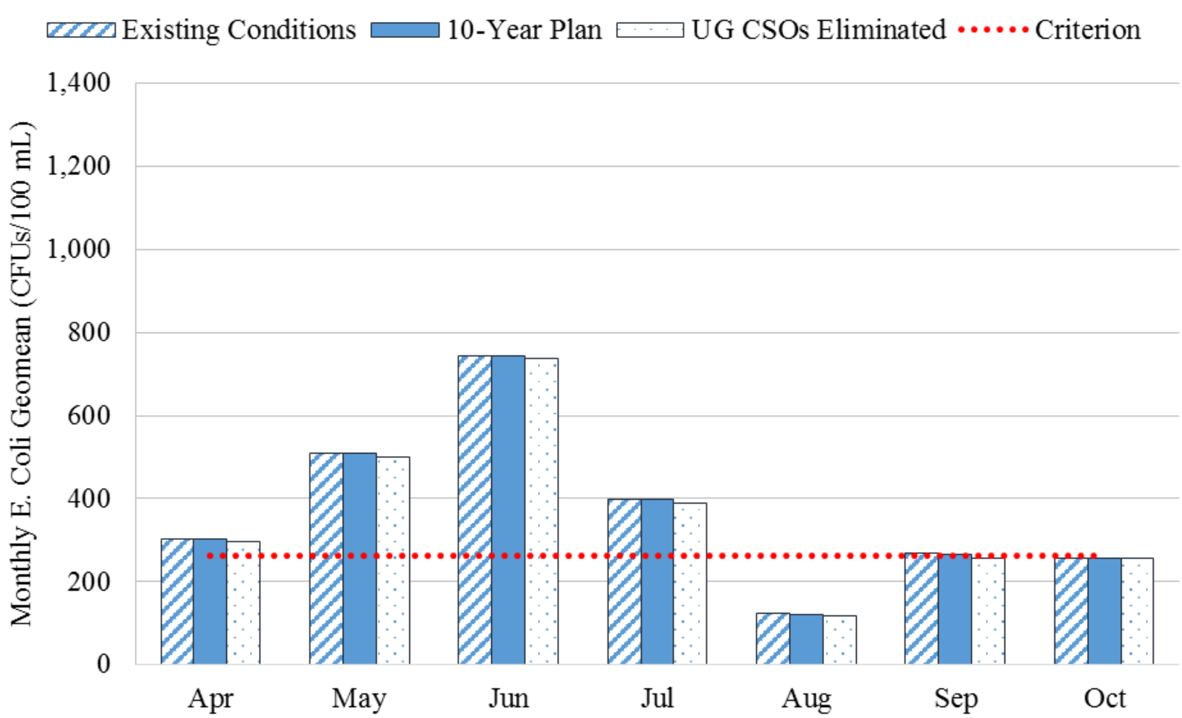


Figure 5-7: Comparison of Reach Monthly Geomean Results for CSO Control Scenarios with Baseline Upstream Boundary Conditions in the Missouri River



The results on a transect basis for these three scenarios are shown on Figure 5-8 for the Kansas River and Figure 5-9 for the Missouri River. These figures present the maximum monthly geomean simulated for each transect. The results of the scenario with the UG CSOs eliminated shows little benefit and no change in the attainment of the WQS. Figure 5-8 shows that implementation of the proposed 10-year CSO improvement plan and reductions from the KCMO Turkey Creek CSO result in a slight improvement in simulated water quality in the Kansas River. The entire Kansas River exceeds the 262 CFUs/100 mL criterion under all scenarios with the exceedances driven by the upstream boundary condition.

Figure 5-8: Comparison of Transect Maximum Monthly Geomean Results for CSO Control Scenarios with Baseline Upstream Boundary Conditions in the Kansas River

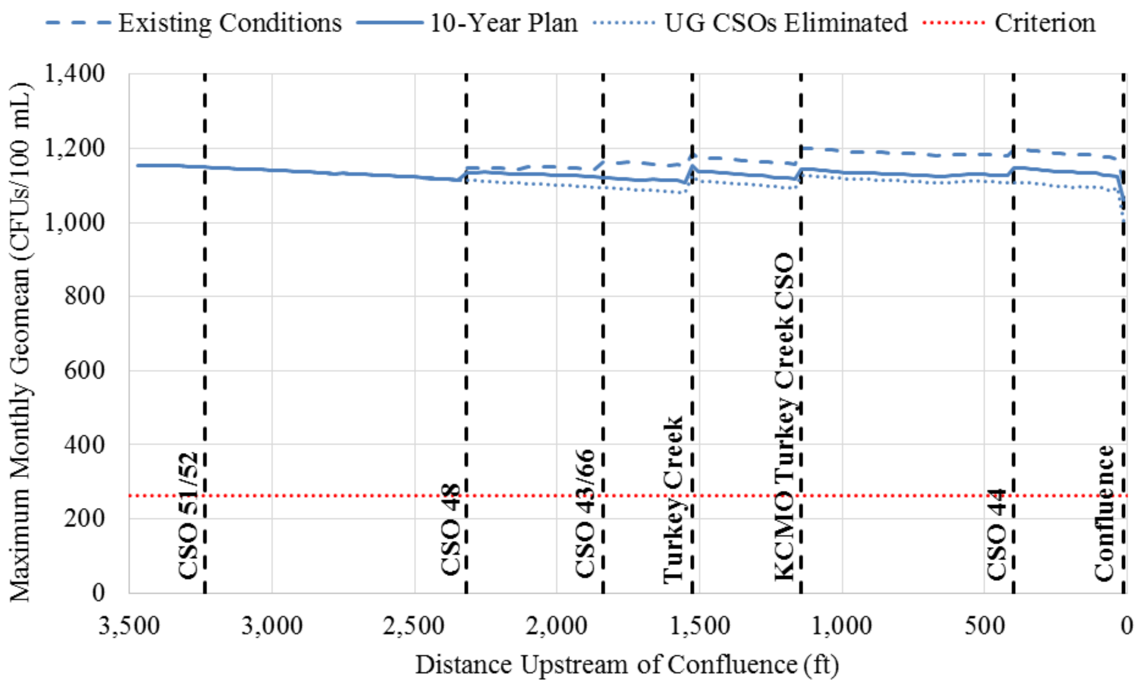


Figure 5-9: Comparison of Transect Maximum Monthly Geomean Results for CSO Control Scenarios with Baseline Upstream Boundary Conditions in the Missouri River

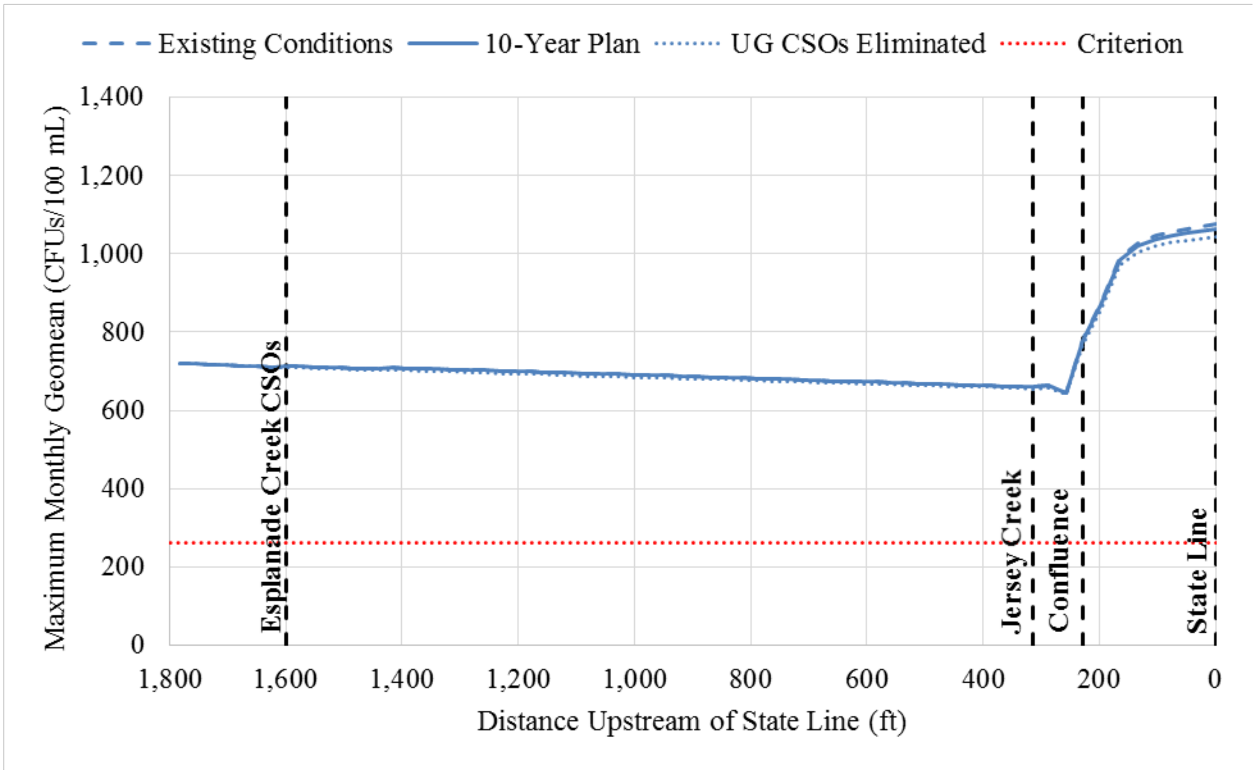


Figure 5-9 shows that the simulations of the scenarios with the proposed 10-year CSO improvement plan and the elimination of UG CSOs result in very little to no discernible improvement in the Missouri River until after the confluence with the Kansas River, and slight improvement from the confluence to the state line. Similar to the Kansas River, the entire Missouri River exceeds the 262 CFUs/100 mL criterion under all scenarios with the exceedances driven by the upstream boundary condition. In conclusion, sources other than the UG CSOs are the driving factor to improve water quality.

5.5.1.2 Upstream Boundary Conditions in Compliance

As demonstrated above, the existing upstream loads prevent WQS attainment even with the UG CSOs eliminated. An analysis was done with the upstream loads lowered to the point of meeting the WQS. In examining this analysis, it is important to recognize that there is no program for reducing these upstream loads. Such a program would entail widespread controls on agricultural and land use practices.

For this theoretical analysis, the upstream boundary conditions for the Kansas River and Missouri River were adjusted to represent conditions that would comply with the 262 CFUs/100 mL criterion. The adjustment was made by taking the baseline upstream boundary conditions and adjusting any values above 262 CFUs/100 mL to 236 CFUs/100 mL, representing compliance with the criterion at the upstream boundaries. This IOCP does not include a plan, cost estimate, or socioeconomic impact evaluation of what would be needed to reduce the upstream boundary conditions as simulated here. While the following discussion may be used to consider “what if” conditions if and when a practical funded upstream control program is in place, these upstream boundary conditions in compliance simulations should not be used to decide the required level of CSO control. This information is presented for the use of future upstream planning only.

Three scenarios were simulated with the upstream boundary compliance conditions as follows:

- Upstream Boundary Compliance Conditions:
    - Existing UG CSOs.
    - KCMO Turkey Creek CSO as proposed in the final alternative of the KCMO OCP. This included a reduction to 510 million gallons of overflow during the Design Year recreational season.
    - Upstream boundary conditions for the Kansas and Missouri Rivers adjusted to comply with 262 CFUs/100 mL monthly geomean criterion.
    - Existing WWTP discharges from the Kaw Point WWTP and KCMO Westside WWTP.
- Upstream Boundary Compliance Conditions with Proposed 10-Year CSO Improvement Plan:
    - UG CSOs as improved under the proposed 10-year CSO improvement plan. Flows were reduced for specified CSOs; E. coli concentrations in the discharges remain the same as in existing conditions.
    - KCMO Turkey Creek CSO as proposed in the final alternative of the KCMO OCP.
    - Upstream boundary conditions for the Kansas and Missouri Rivers adjusted to comply with 262 CFUs/100 mL monthly geomean criterion.
    - Kaw Point WWTP discharges as proposed in the 10-year CSO improvement plan and existing KCMO Westside WWTP discharges.
- Upstream Boundary Compliance Conditions with Complete UG CSO Elimination:
    - UG CSOs eliminated via separation. Discharge flows consistent with the proposed 10-year CSO improvement plan, but with E. coli concentrations in the discharges reduced to the separate stormwater event mean concentration of 8,051 CFUs/100 mL.
    - KCMO Turkey Creek CSO as proposed in the final alternative of the KCMO OCP.
    - Upstream boundary conditions for the Kansas and Missouri Rivers adjusted to comply with 262 CFUs/100 mL monthly geomean criterion.
    - Kaw Point WWTP discharges as proposed in the 10-year CSO improvement plan and existing KCMO Westside WWTP discharges.

The results on Figure 5-10 and Figure 5-11 show that under upstream compliance boundary conditions, the monthly geomean on a reach basis meets the applicable criterion of 262 CFUs/100 mL in all of the seven months of the recreation season in both the Kansas and Missouri Rivers. Figure 5-10 and Figure 5-11 also show that the reach monthly geomean values improve to a small degree with the implementation of the proposed 10-year CSO improvement plan and that eliminating UG CSOs provides little additional benefit. The greatest benefit on a monthly basis comes in August in the Kansas River, where eliminating UG CSOs results in a geomean of 17 CFUs/100 mL less than 10-year plan conditions. For the Missouri River, the maximum benefit of eliminating UG CSOs is only 5 CFUs/100 mL.

Figure 5-10: Comparison of Reach Monthly Geomean Results for CSO Control Scenarios with Upstream Compliance Boundary Conditions in the Kansas River

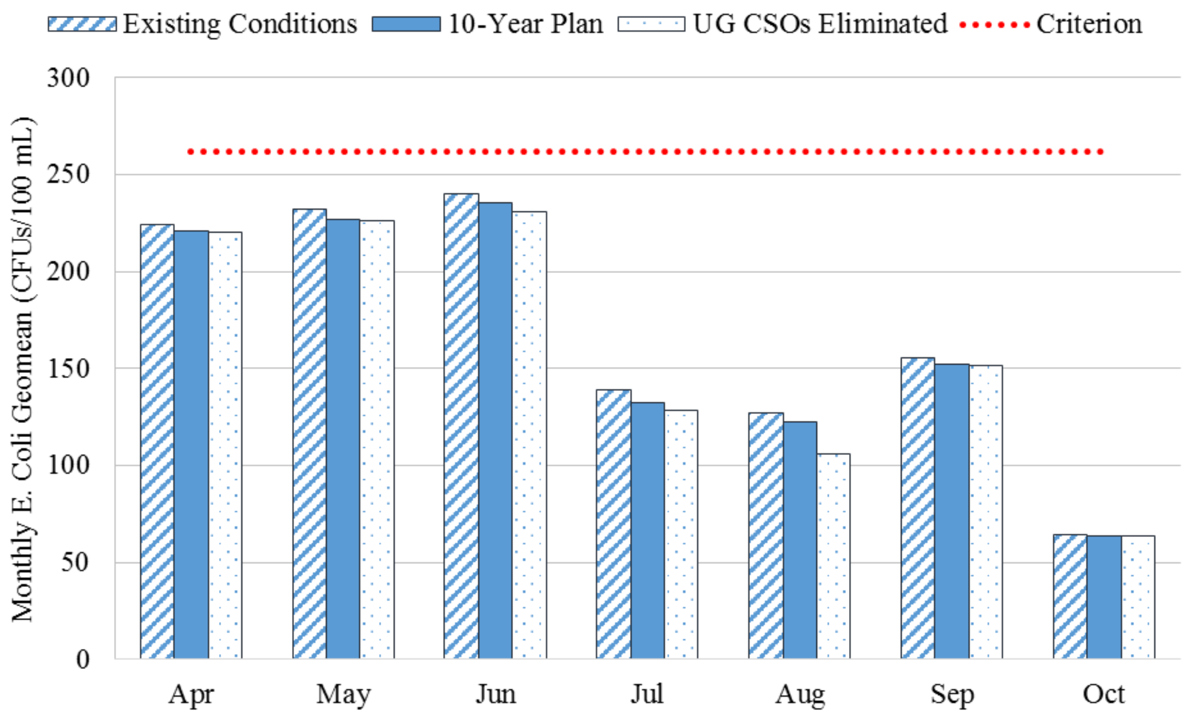
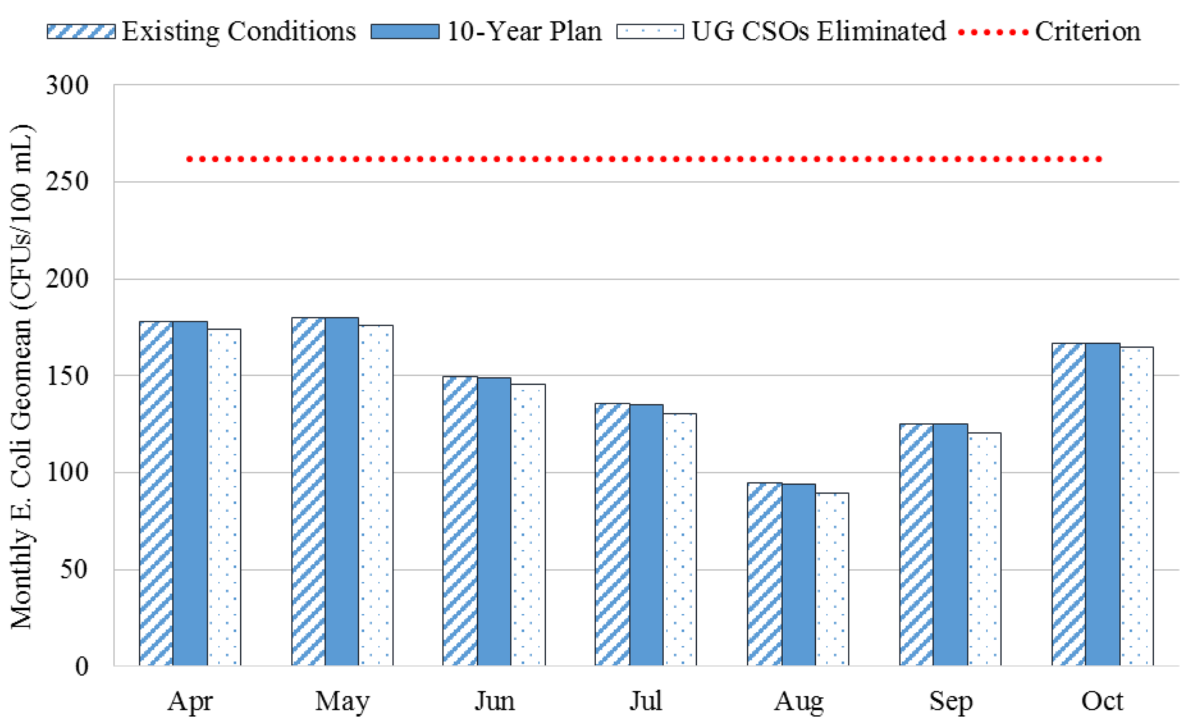


Figure 5-11: Comparison of Reach Monthly Geomean Results for CSO Control Scenarios with Upstream Compliance Boundary Conditions in the Missouri River



The results on a transect basis for these three upstream compliance scenarios are shown on Figure 5-12 for the Kansas River and Figure 5-13 for the Missouri River. These figures present the maximum monthly geomean simulated for each transect. Figure 5-12 shows that implementation of the proposed 10-year CSO improvement plan results in some improvement in simulated water quality in the Kansas River downstream of CSO 48. While a couple of transects slightly exceed the 262 CFUs/100 mL criterion with existing CSO conditions, implementation of the proposed 10-year CSO improvement plan results in compliance throughout the reach. The results of the scenario with UG CSOs eliminated shows some additional benefit, but nothing significant. These simulations demonstrate that marginal benefit can be realized by CSO control.

Figure 5-13 shows that the simulations of the upstream compliance scenarios result in compliance throughout the Missouri River for all three scenarios. The proposed 10-year CSO improvement plan results in no discernible improvement in the Missouri River until after the confluence with the Kansas River, and very little improvement from the confluence to the state line. Elimination of UG CSOs results in slight improvement in the Missouri River downstream of Esplanade Creek CSO inputs to the state line. Similar to the Kansas River, the entire Missouri River meets the 262 CFUs/100 mL criterion under the proposed 10-year CSO improvement plan and marginal benefit is realized from additional CSO control.

These simulations demonstrate that the proposed 10-year CSO improvement plan would result in water quality standards being attained if other sources were reasonably controlled toward meeting the applicable criterion, and that little additional recreational use benefit as judged by the WQS is gained by reducing UG CSOs further. While local CSS and separate stormwater discharges may have a transient effect on E. coli concentrations in the rivers (i.e., during local wet weather events), the influence of these sources is short-term and the impact of these wet weather sources on the monthly geomeans is limited. These simulations indicate that the proposed 10-year CSO improvement plan is adequate to demonstrate compliance with the *CSO Control Policy* for the Kansas and Missouri Rivers.

Figure 5-12: Comparison of Transect Maximum Monthly Geomean Results for CSO Control Scenarios with Upstream Compliance Boundary Conditions in the Kansas River

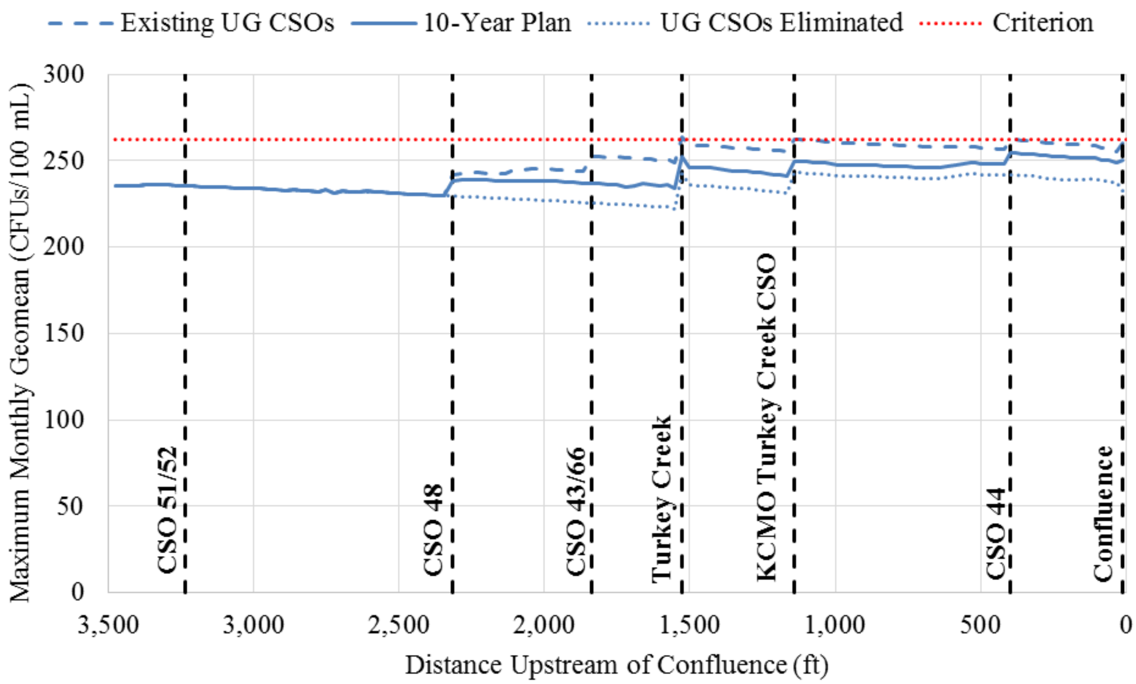
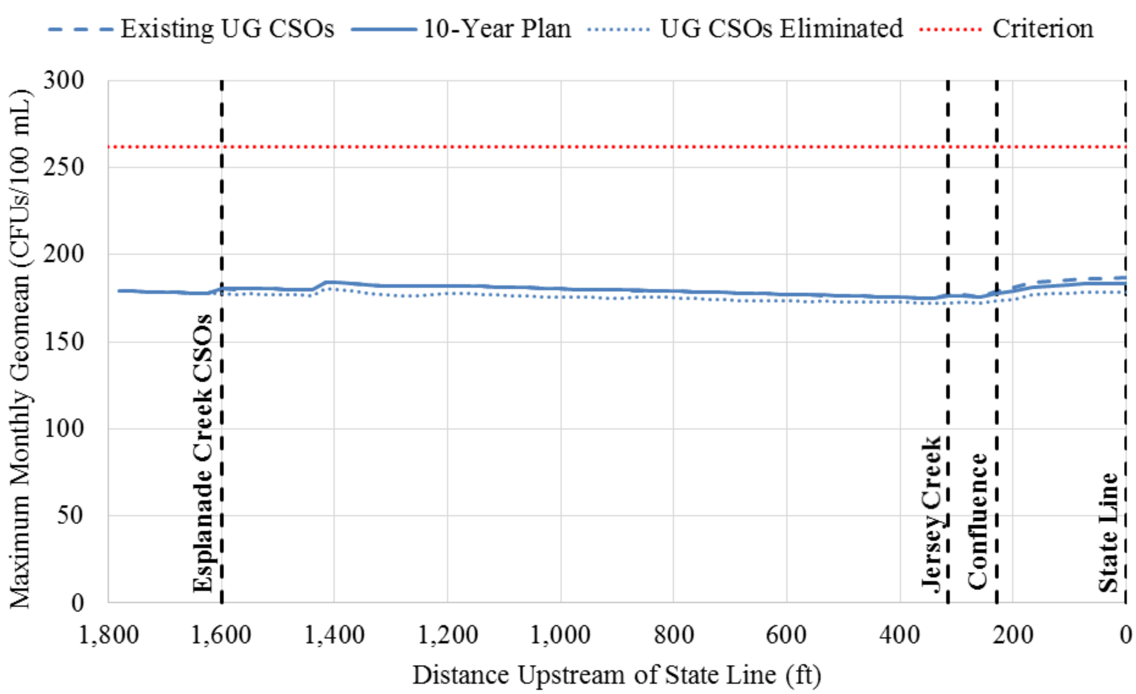


Figure 5-13: Comparison of Transect Maximum Monthly Geomean Results for CSO Control Scenarios with Upstream Compliance Boundary Conditions in the Missouri River



5.5.2 Evaluation of CSO Control Benefits to Jersey Creek and Mattoon Creek

An evaluation of the benefits of CSO control was conducted for the Design Year recreation season for Jersey Creek and Mattoon Creek. The Secondary Contract Recreation - Class a criterion applies to Jersey Creek, which is 2,358 CFUs/100 mL as a geomean, and the Primary Contact Recreation – Class B criterion applies to Mattoon Creek, which is 262 CFUs/100 mL. Simulated separate stormwater runoff and CSO discharges were compiled on a daily basis in each creek. Travel time within each creek is less than a day. Therefore, the combined discharges on a given day were considered representative of the conditions in the stream on that day. As stated previously, the most recent CSS model results were used in this assessment.

On days with no discharge to the streams, a “background” concentration based on an evaluation of available data was assumed. The USGS collects one sample per year from three Jersey Creek locations, totaling eight samples between 2007 and 2015 that do not appear to be impacted significantly by wet weather events. The UG IOCP sampling effort in 2013 collected routine samples from three locations in Jersey Creek and one location at the mouth of Mattoon Creek, for a total of twenty-one samples in Jersey Creek and four samples in Mattoon Creek that do not appear to be impacted by wet weather events. The median value of these samples is 631 CFUs/100 mL in Jersey Creek and 89 CFUs/100 mL in Mattoon Creek. These values are below the applicable criterion in each stream. Also, note that during dry weather conditions, the flow and water depth in these streams is very low and exposure is likely very limited.

Figure 5-14 and Figure 5-15 present the simulated monthly geomeans for three scenarios for Jersey Creek and Mattoon Creek, respectively:

- Existing CSOs.
- Proposed 10-year CSO Improvement Plan:
    - UG CSOs as improved under the proposed 10-year CSO improvement plan. Flows reduced for specified CSOs; E. coli concentrations in the discharges remain the same as in existing conditions.
- Complete UG CSO Elimination:
    - UG CSOs eliminated via separation. Discharge flows consistent with the proposed 10-year CSO improvement plan but with E. coli concentrations in the discharges reduced to the separate stormwater event mean concentration of 8,051 CFUs/100 mL.

Figure 5-14: Comparison of Geomean Results for CSO Control Scenarios in Jersey Creek

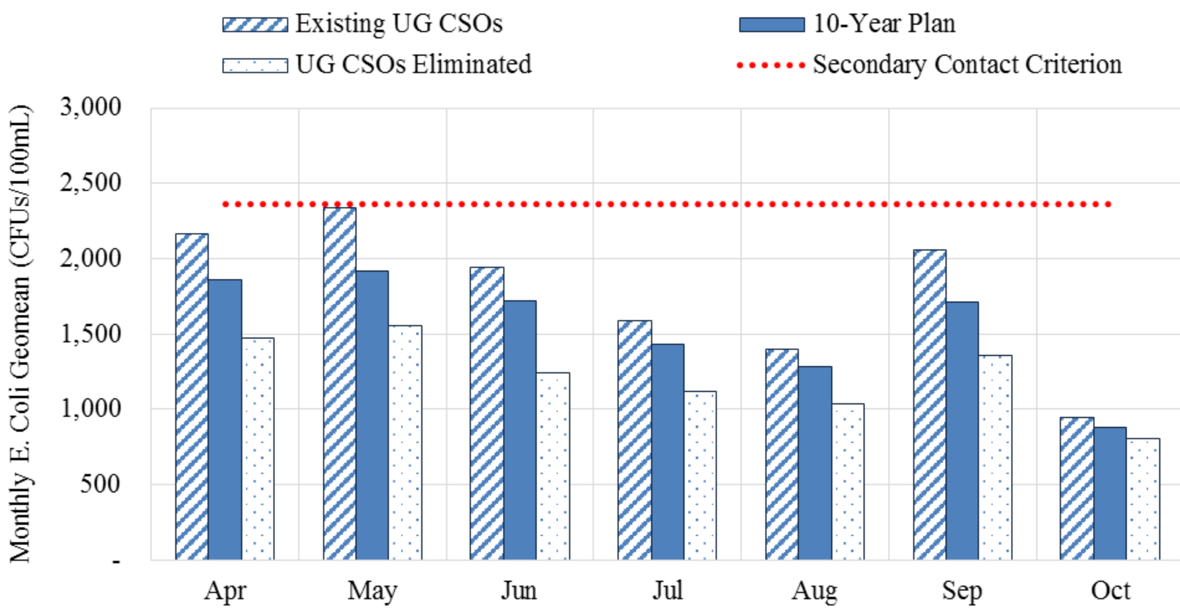


Figure 5-15: Comparison of Geomean Results for CSO Control Scenarios in Mattoon Creek

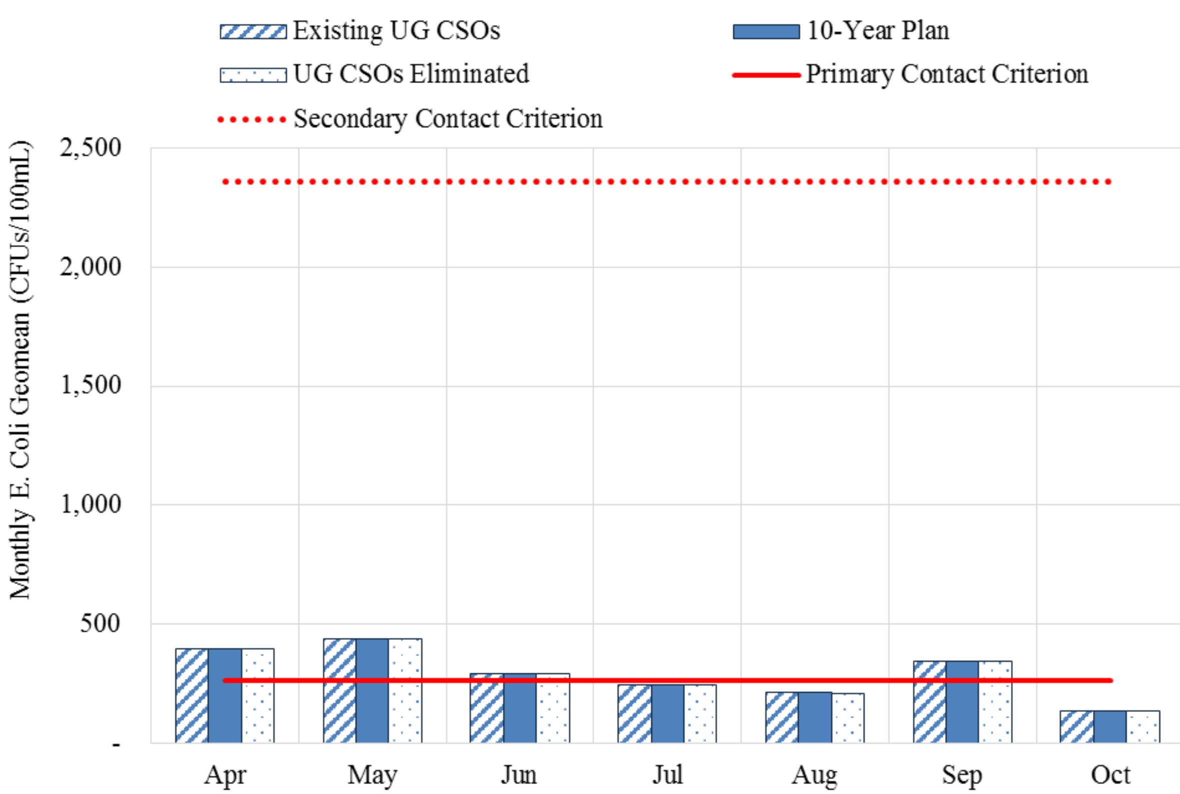
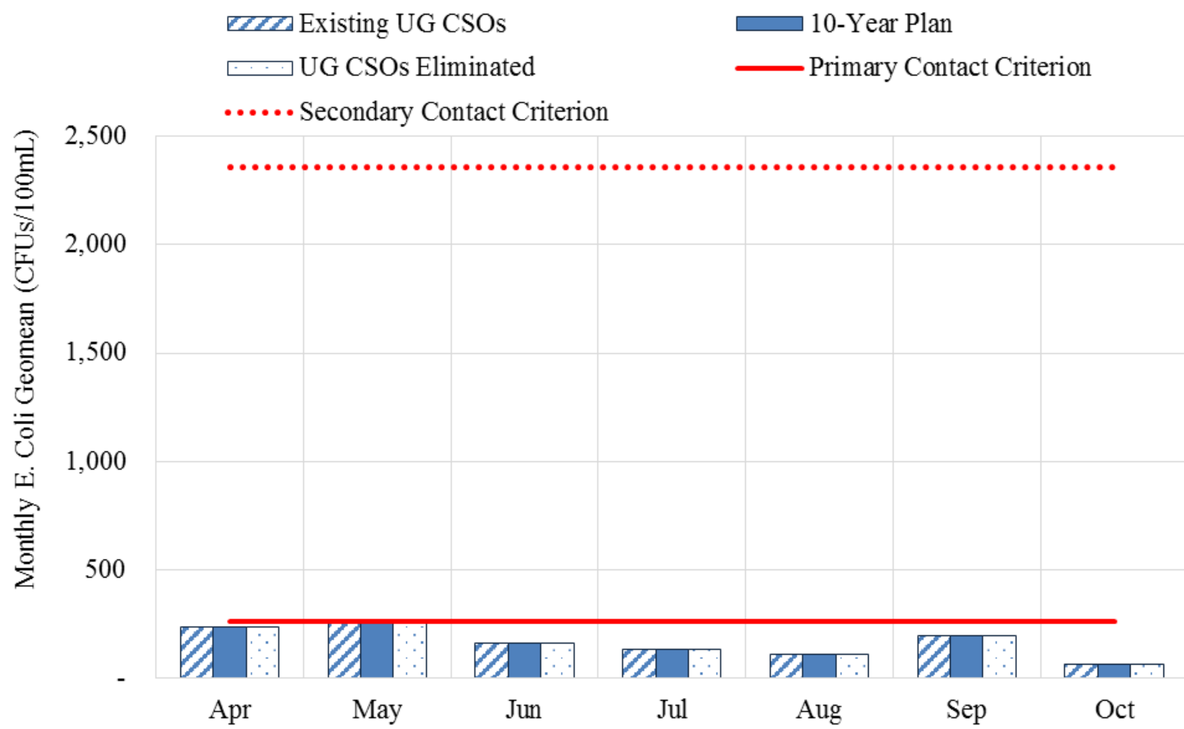


Figure 5-14 and Figure 5-15 show that under existing conditions, all months meet the secondary contact criterion in Jersey Creek and four months exceed the primary contact criterion in Mattoon Creek. There is improvement in Jersey Creek with the implementation of the proposed 10-year CSO improvement plan, with the maximum monthly geomean in May dropping from 2,333 CFUs/100 mL under existing conditions to 1,920 CFUs/100 mL. While the flows are very low on those days, the concentrations are high and; therefore, impact the geomean calculation with the same weight as any other day. Additional improvement is simulated in Jersey Creek when CSOs are separated. These values indicate that each monthly geomean is below the applicable criterion in Jersey Creek and that the proposed 10-year CSO improvement plan is sufficient to meet the *CSO Control Policy* Demonstration Approach.

The results for Mattoon Creek indicate that no improvement is expected with the implementation of the proposed 10-year CSO improvement plan or with complete CSO elimination. The existing CSO discharges for the Design Year into Mattoon Creek are very small, occur only twice during the recreation season, and have very little impact on the calculation of the monthly geomean. From this, it can be concluded that Primary Contact water quality standards and uses cannot be consistently met in Mattoon Creek due to pollution sources other than CSOs. However, as discussed in Section 2.5, the appropriate WQS for Mattoon Creek is Secondary Contract Recreation. In all cases, Mattoon Creek meets the appropriate WQS.

These three scenarios were also assessed with a reduced background concentration such that the applicable criteria would be met in Mattoon Creek. The results of these simulations are presented on Figure 5-16. A background concentration of 40 CFUs/100 mL in Mattoon Creek resulted in simulated monthly geomeans meeting the applicable criterion in all months. These background concentrations would require a 55% reduction in Mattoon Creek background E. coli concentration. Again, no improvement in monthly geomeans is expected with implementation of the proposed 10-year CSO improvement plan or with complete elimination of CSOs.

Figure 5-16: Comparison of Geomean Results for CSO Control Scenarios in Mattoon Creek with Reduced Background Concentrations



6.0 SSO REMEDIATION PLAN

6.1 Introduction

The remediation plan to control SSOs in the entire SSS for the two-year and five-year storm events is documented in this Section. The analysis of improvement alternatives to control SSOs within the UG SSS is presented in detail in Chapter 6 of the *SSS Characterization Report*. The objective of the Alternatives Analysis was to develop and complete the preliminary evaluation of feasible alternative solutions to control SSOs for the two-year and five-year storm events. This level of service range was proposed in the *SSE Work Plan*. This analysis included an economic evaluation of alternatives on both a capital cost and net present value basis to determine the most cost-effective alternatives. All projects presented in this section were sized to convey or treat the projected flow rates for future conditions (Year 2033) as quantified in Section 2.2. Unless otherwise noted, estimated costs are the same for the two-year and five-year storm events.

The alternatives were further evaluated to identify suitable sites for the recommended improvements and to determine whether the alternatives could be constructed and operated at a reasonable cost at the proposed sites. The results of this SSO Control Facility Site Suitability Assessment were documented in Chapter 7 of the *SSS Characterization Report*. Chapter 8 of the *SSS Characterization Report* presents the results of the alternatives evaluation and the control alternatives recommended for further evaluation.

6.2 Projects

The improvement projects included in this SSO Remediation Plan are categorized by the WWTP serving the basin they are located in as follows:

- Basins tributary to Plant 20 and Wolcott WWTP (western part of the service area).
- Basins tributary to Kaw Point WWTP (SSS basins only).

The cost estimates in the following sections were primarily developed using the *UG Basis of Cost Manual*. The costs for capacity improvements presented in this section assume no I/I removal (based on results from the I/I Reduction Demonstration Project). However, it may be possible to realize cost reductions if I/I removal is achieved within these basins during proposed system renewal efforts.

6.2.1 Basins Tributary to Plant 20 and Wolcott WWTP

Improvement alternatives were developed to determine facility sizing to control SSOs for the two-year and five-year storm events in the basins tributary to Plant 20 and Wolcott WWTP for future conditions. During the alternatives evaluation, it was determined that rerouting flows from PS 50 was the preferred alternative. This alternative involves rerouting flow from PS 50 by gravity to an expanded Wolcott WWTP, allowing PS 50 to be decommissioned (refer to the *SSS Characterization Report* for details on the alternative evaluations). This alternative was the most cost-effective from a life cycle cost basis and provided a significant early reduction in SSOs. This early action project would reduce the peak and average flows to PS 6 and Plant 20, significantly decreasing the magnitude and frequency of SSOs in the SSS area. The future decommissioning of PS 50 and rerouting of flows to the Wolcott WWTP, therefore, were taken into account in determining the sizing and schedule of the associated projects included in the remediation plan.

6.2.1.1 Wolcott WWTP Expansion and Associated Projects

Construction of the expanded Wolcott WWTP along with the rerouting of flows from PS 50 would reduce the peak and average flows to PS 6 and Plant 20, decreasing the magnitude and frequency of the SSOs within the SSS and the corresponding capacity improvements required in the southern service area and the gravity system upstream. The proposed improvements are also necessary to meet current and future regulatory discharge requirements at the Wolcott WWTP.

Rerouting flow will also lead to other water quality benefits due to improved wastewater treatment processes at the expanded Wolcott WWTP and reduced loadings at Plant 20. An average daily flow of approximately 1 mgd currently treated at Plant 20 will be rerouted to the new WWTP. Rerouting this flow will result in immediate reductions in nutrient loading to the Kansas River, which is impaired for phosphorus. This flow, along with the flow currently treated at the Wolcott WWTP, will receive a higher level of treatment, i.e., BNR. There are no existing effluent limits in place for nitrogen and phosphorous at Plant 20. The expanded Wolcott WWTP is anticipated to have effluent limits of seasonal averages of 10 mg/l of TN and 1 mg/l of TP. Improved effluent quality at the Wolcott WWTP will also have a direct and positive impact on water quality in Connor Creek, including reduced ammonia and nutrient levels.

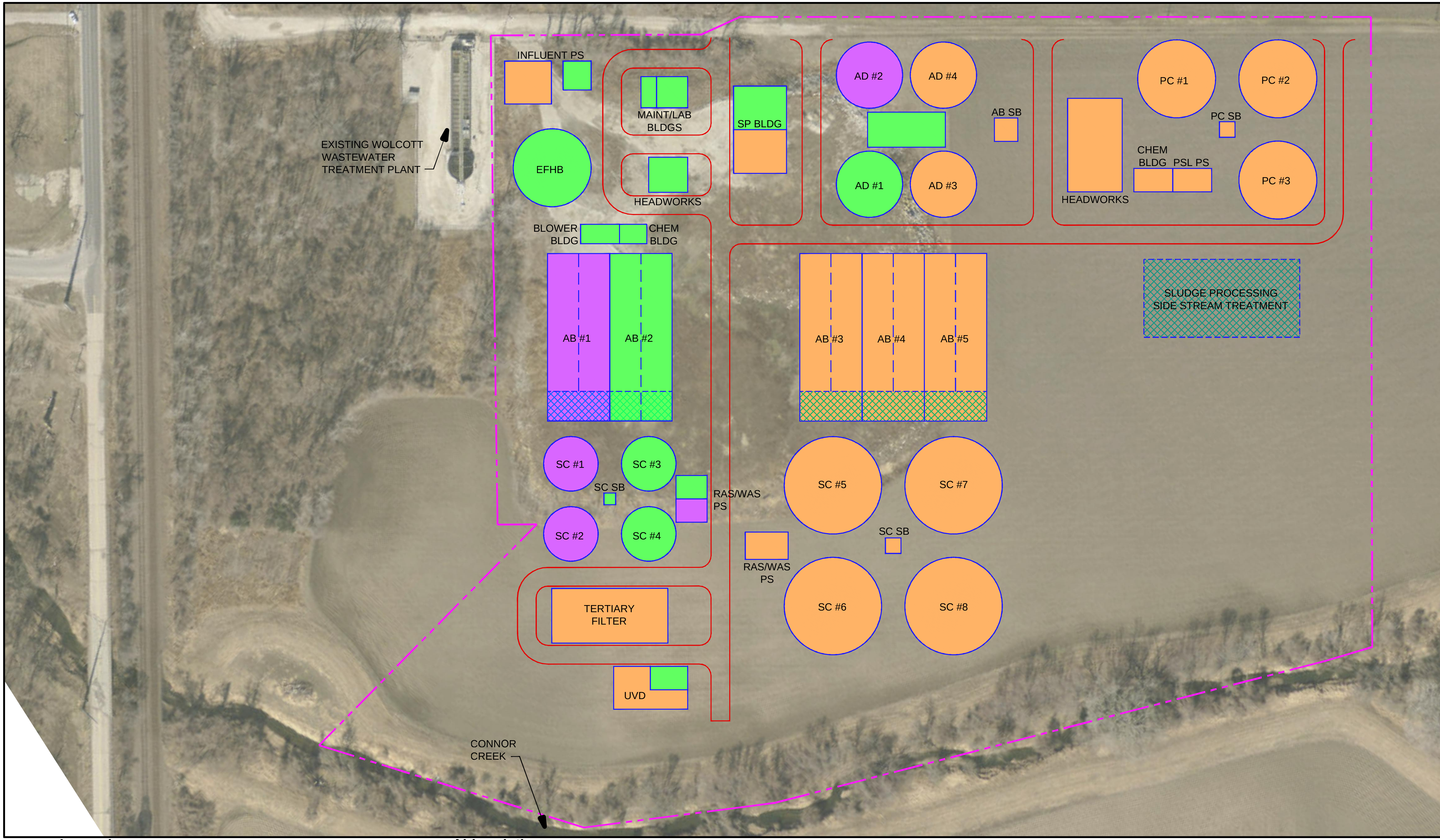
The future size of the Wolcott WWTP replacement is projected to be 4 mgd to accommodate the flows rerouted from PS 50 and the anticipated growth for a 20-year planning period. It is recommended to construct these improvements in two phases. A 2 mgd plant would initially be constructed and designed for expansion to 4 mgd when necessitated by growth. The 2 mgd plant would have the capacity to treat the current average day flows, approximately 1.1 mgd from the Wolcott WWTP and PS 50 service areas, and the projected future flows from growth projected to occur within the next several years. The plant would later be expanded to 4 mgd when flows from additional future growth within the service area approach the initial 2 mgd capacity.

Storage will need to be constructed adjacent to the Wolcott WWTP to accommodate the peak flows caused by the existing and projected future flow and peak flows from the PS 50 service area. The EFHB volume is estimated based on the assumed Wolcott WWTP influent pump station capacity of 12 mgd, which is equal to the projected 3:1 throughput of the WWTP after the PS 50 reroute. A preliminary layout of the improvements to expand the Wolcott WWTP to 4 mgd ADF capacity is presented on Figure 6-1. Table 6-1 presents the expansion cost estimate for the Wolcott WWTP with the PS 50 reroute and the EFHB.

Table 6-1: Wolcott WWTP Expansion with PS 50 Reroute Cost Estimate

Cost Item	Estimated Cost (2015 $)
Wolcott WWTP and EFHB (4 mgd ADF)[1]	$34,200,000
ELA (25%)	$8,600,000
Contingency (25%)	$10,700,000
Total	**$53,500,000**

Notes:
1. A treatment cost of $8.50 per gallon was used; includes WWTP expansion and influent pump station costs.



Legend

- Phase 1 (2 MGD)
- Phase 2 (4 MGD)
- Phase 3
- Ultimate
- Property Line
- Access Road

Abbreviations

AB = Aeration Basin
AD = Aerobic Digester
BLDG = Building
CHEM = Chemical
EFHB = Excess Flow Holding Basin
LAB = Laboratory
MAINT = Maintenance
PC = Primary Clarifier
PS = Pump Station
PSL = Primary Sludge
RAS = Return Activated Sludge
SB = Splitter Box
SC = Secondary Clarifier
SP = Solids Processing
UVD = Ultraviolet Disinfection
WAS = Waste Activated Sludge

0 60 120

SCALE: 1" = 120'

Figure 6-1
Wolcott WWTP Expansion
Preliminary Site Layout

The decommissioning of PS 50 involves rerouting the pump station flows north by gravity via a new 42-inch diameter 16,000 feet gravity interceptor to the Wolcott WWTP. Table 6-2 presents the estimated interceptor costs for the Lower Connor Creek Interceptor.

Table 6-2: Lower Connor Creek Interceptor and Pump Station 50 Elimination Cost Estimate

Cost Item	Estimated Cost (2015 $)
Construction Cost[1]	$3,500,000
Land Acquisition Cost (5%)	$200,000
ELA (25%)	$900,000
Contingency (25%)	$1,200,000
Total	$5,800,000

Notes:

1. Interceptor sized to be 42-inch diameter based on ultimate conditions. Assumes a cost of $215/LF to account for manholes, appurtenances, potential boring, and unknown site restrictions. Note that this cost is greater than as calculated using the *UG Basis of Cost Manual*. This cost was increased to be conservative and match recent project costs for similar projects. It is assumed that the interceptor is routed from PS 50 by gravity to the existing Wolcott WWTP site and that PS 70 will be replaced with an influent pump station located at the Wolcott WWTP.

Decommissioning PS 50 will require some ancillary improvements to three small pump stations that connect to the existing PS 50 force main. Flow from PS 15 is currently pumped into the PS 50 force main; thus, modifications will need to be made to address flow conveyance from PS 15 after PS 50 is decommissioned. Two options to reroute PS 15 were evaluated:

- Decommission PS 15 and reroute flow by gravity to the northwest to manhole 470-044-MH.
- Install a new 4-inch diameter force main parallel to the existing force main and discharge in the existing receiving manhole of the PS 50 force main.

Decommissioning PS 15 and rerouting by gravity was the selected alternative. The estimated costs for this alternative are presented in Table 6-3.

Table 6-3: Pump Station 15 Decommission and Gravity Sewer Cost Estimate

Cost Item	Quantity	Unit	Unit Price	Estimated Cost (2015 $)
8-inch PVC Pipe - Gravity	1,740	LF	$96.00	$170,000
Rock Cut	1,870	CY	$65.00	$120,000
Permanent Easement (20 ft)	34,800	sf	$1.00	$35,000
Temporary Easement (20 ft)	34,800	sf	$0.25	$9,000
ELA (25%)				$84,000
Contingency (25%)				$100,000
Total				$520,000

PS 76 and PS 77 were constructed to serve a planned development located in the Connor Creek watershed. The wastewater infrastructure was constructed; however, development halted and the area has not been developed. The pump stations have not been placed into service. As currently configured, PS 77 would pump east to the PS 76 service area. Flow would then be pumped from PS 76 into the PS 50 force main.

These stations were evaluated to determine the recommended plan to provide service to this area after PS 50 is decommissioned. It was determined that PS 77 could be decommissioned and the flow from its service area can be routed west by gravity through approximately 700 feet of gravity sewer line, tying into the existing gravity collection system in Connor Creek. Flow from the PS 76 service area would be pumped west to discharge into the gravity sewer system servicing PS 77. The estimated costs to complete these projects are presented in Table 6-4.

Table 6-4: Pump Stations 76 and 77 Decommission and Gravity Sewer Cost Estimate

PS	Cost Item	Quantity	Unit	Unit Price	Estimated Cost (2015 $)
76	6-inch DIP – Force Main	1,300	LF	$55.00	$72,000
76	Rock Cut	385	CY	$65.00	$25,000
77	8-inch PVC Pipe - Gravity	700	LF	$79.00	$55,000
77	Permanent Easement (20 ft)	14,000	sf	$1.00	$14,000
77	Temporary Easement (20 ft)	28,000	sf	$0.25	$7,000
ELA (25%)					$43,000
Contingency (25%)					$54,000
Total					$270,000

6.2.1.2 Pipe Capacity Improvements

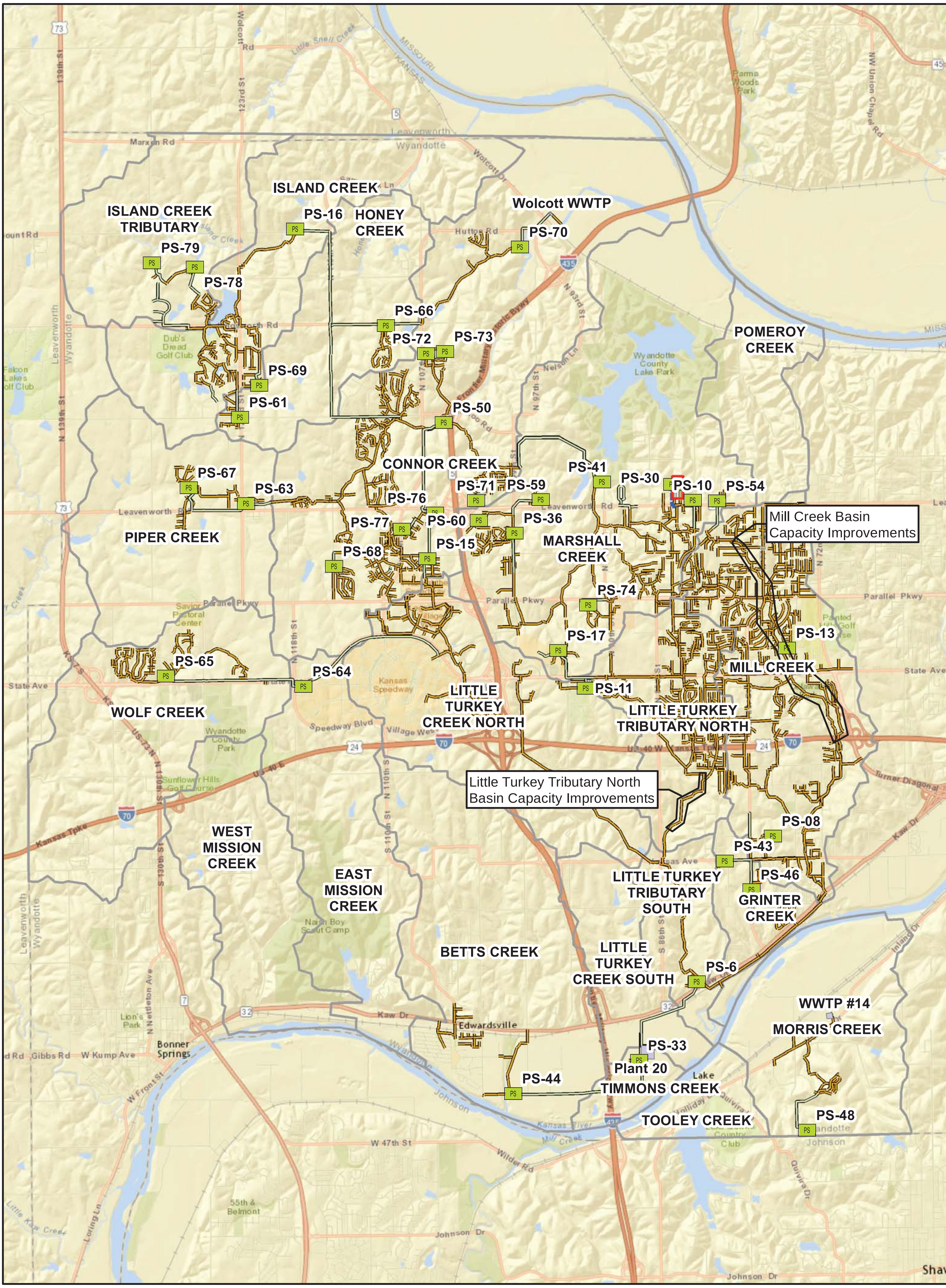
Collection system improvements were evaluated in the areas with surcharging above the allowable limits defined in the *SSE Work Plan* (surcharged less than 8-feet below the surface) during the two-year and five-year storm events. This included increasing capacity of overcapacity segments within the SSS by either parallel pipe installation or upsizing the existing pipe. Improvements were sized to convey peak flows generated by the design storm events within the pipe (i.e., no surcharging). Pipes with only minor surcharging were not included in the improvements (e.g., surcharging 8 feet or more below the ground surface, or minor surcharging in the lines immediately upstream of pump stations that is caused by the operation of pump stations).

To be conservative, cost estimates were prepared assuming replacement with a larger pipe rather than constructing a parallel relief sewer. The recommended pipe capacity improvement projects and associated costs are presented in Table 6-5. The locations of these improvement projects are identified on Figure 6-2.

Table 6-5: Pipe Capacity Improvement Projects Cost Estimates – Basins Tributary to Plant 20 and Wolcott WWTP

Project	Estimated Cost (2015 $)	
	Two-Year Storm Event	Five-Year Storm Event
Mill Creek Basin Capacity Improvements	$2,300,000	$4,200,000
Little Turkey Tributary North (LTTN) Basin Capacity Improvements	$30,000	$600,000

The costs above assume no I/I removal. However, it may be possible to realize minor cost reductions if I/I removal is achieved within these basins through system renewal efforts. It is anticipated that system rehabilitation and I/I removal efforts will be conducted within these basins prior to designing and constructing capacity related improvements.



Legend

- PS Pump Station
- Treatment Facility
- Force Main
- Existing Gravity Main
- Basin Boundary

0 1 2 Miles

Data Sources: HDR Inc, ESRI
Coordinate System: NAD_1983_StatePlane_Kansas_North_FIPS_1501

Figure 6-2

Pipe Capacity Improvement Projects - Basins Tributary to Plant 20 and Wolcott WWTP

6.2.1.3 Non-Modeled Pump Station Improvements

Recommendations were developed for each of the non-modeled pump stations identified to be in need of capacity improvements. The magnitude of the required capacity increases were developed using projected peak wet weather flows based on the flow projection methodology presented in the *SSS Characterization Report*. Prior to any improvements, the UG plans to first perform a sanitary sewer evaluation study (SSES) to determine if the capacity issues can be addressed cost effectively through I/I reduction.

6.2.1.3.1 Pump Station 8

PS 8 is a small grinder pump station with a design firm capacity of 11 gpm. Flow projections indicate the station lacks the capacity to convey peak wet weather flows. There is an overflow at the station, and records show the overflow has activated in recent years.

It is recommended to first further investigate the magnitude of wet weather flows to PS 8 through temporary flow monitoring of influent flows and/or monitoring of the overflow to confirm if overflow events are occurring during large storm events. If overflows are occurring, it is recommended to address them by increasing station capacity. The estimated costs to complete capacity improvements at PS 8 are presented in Table 6-6.

Table 6-6: PS 8 Capacity Improvements Cost Estimate

Pump Station ID	Design Firm Capacity (gpm)	Improved Capacity Two-Year Storm Event (gpm)[1]	Capacity Improvement Estimated Cost (2015 $)	Annual PS O&M Cost	Improved Capacity Five-Year Storm Event (gpm)[2]	Capacity Improvement Estimated Cost (2015 $)	Annual PS O&M Cost
8	11	35	$24,000	$27,000	40	$29,000	$27,000

Notes:
1. Proposed capacity to convey projected flows for two-year storm event under future (Year 2033) conditions.
2. Proposed capacity to convey projected flows for five-year storm event under future (Year 2033) conditions.

6.2.1.3.2 Pump Station 11

PS 11 is a vacuum-primed pump station with a design firm capacity of 80 gpm (the current tested firm capacity is 54 gpm). Flow projections indicate the station lacks the capacity to convey peak wet weather flows. There is an overflow at the station; however, there are no records confirming that the overflow has activated in recent years.

Similar to PS 8, it is recommended to investigate the magnitude of wet weather flows to PS 11 through temporary flow monitoring of influent flows and/or monitoring of the overflow to determine if overflow events are occurring during large storm events. If overflows are occurring, it is recommended to address them by increasing station capacity. The estimated costs to complete capacity improvements at PS 11 are presented in Table 6-7.

Table 6-7: PS 11 Capacity Improvements Cost Estimate

Pump Station ID	Design Firm Capacity (gpm)	Improved Capacity Two-Year Storm Event (gpm)[1]	Capacity Improvement Estimated Cost (2015 $)	Annual PS O&M Cost	Improved Capacity Five-Year Storm Event (gpm)[2]	Capacity Improvement Estimated Cost (2015 $)	Annual PS O&M Cost
11	80	100	$20,000	$27,000	120	$40,000	$27,000

Notes:
1. Proposed capacity to convey projected flows for two-year storm event under future (Year 2033) conditions.
2. Proposed capacity to convey projected flows for five-year storm event under future (Year 2033) conditions.

6.2.1.3.3 Pump Station 10 and Pump Station 30

PS 10 contains two submersible pumps with a design firm capacity of 125 gpm (the current tested firm capacity is 100 gpm). Flow projections indicate the station lacks the capacity to convey peak wet weather flows. There is an overflow in place to a small EFHB, and records show the overflow has activated in recent years.

PS 30 is a vacuum-primed pump station and has a design firm capacity of 100 gpm (the current tested firm capacity is 69 gpm). Similar to PS 10, flow projections indicate the station lacks the capacity to convey peak wet weather flows. There is an overflow in place at the station, and records show the overflow has activated in recent years.

PS 30 discharges to a 4-inch diameter cast iron force main routed to a gravity sewer that flows to PS 10. The force main from PS 30 is aging and is believed by the UG staff to be in poor condition. In lieu of repairing or replacing the existing force main, an alternative to abandon the existing force main and realign the force main to the PS 41 service area was evaluated. Aside from the benefits of replacing the aging force main, this alternative would provide additional benefits in further alleviating the capacity issues at PS 10. The proposed force main alignment is presented on Figure 6-3.

Legend

- Pump Station
- Sewer Manhole
- Existing Gravity Main
- Force Main
- Proposed Force Main
- Pump Station Service Area Boundary

N

0 150 300 Feet

Data Sources: HDR Inc, ESRI
Coordinate System: NAD_1983_StatePlane_Kansas_North_FIPS_1501

Figure 6-3

Pump Station 30 Force Main Alignment

This alternative was compared to replacing the existing force main and continuing to route the flow from PS 30 to PS 10. Both alternatives assume capacity improvements may be necessary at both pump stations. The comparison indicates that rerouting the force main from PS 30 away from the PS 10 service area is the more cost effective option.

In 2016, the UG completed a survey for the new force main alignment and initiated an SSES study in the collection system upstream of PS 30. The UG will evaluate if wet weather flows can be reduced through I/I removal efforts in this service area, which could potentially eliminate the need for the capacity improvements specified here.

It is recommended that the capacity issues at these pump stations be addressed in the following sequence:

- Construct new force main at PS 30 reducing flow/overflow volume at PS 10.
- After the SSES and I/I removal efforts are completed, monitor flows to verify the magnitude of wet weather flows to PS 30.
- Complete capacity improvements at PS 30, if needed.
- After the reroute is complete, evaluate the need for capacity improvements at PS 10. Evaluate the reduction in peak flows and the storage capacity available at the EFHB to determine if capacity improvements at PS 10 are still necessary after the PS 30 service area has been routed away from the PS 10 service area.

The estimated costs for rerouting the PS 30 force main away from PS 10 are presented in Table 6-8.

Table 6-8: PS 10 and 30 Capacity and Force Main Improvements Cost Estimate

Cost Item	Estimated Cost (2015 $)	
	Two-Year Storm Event	Five-Year Storm Event
Installation of new Force Main[1]	$140,000	$140,000
PS 10 Capacity Improvements[2]	$75,000	$120,000
PS 30 Capacity Improvements	$15,000	$30,000
Total	**$230,000**	**$290,000**
Annual PS 10 O&M Cost	$29,000	$30,000
Annual PS 30 O&M Cost	$27,000	$27,000

Notes:

1. Per the *UG Basis of Cost Manual*, the smallest pipe diameter for DIP force main is 6-inches. Force main costs are assumed to be a 4-inch diameter DIP including site adjustment factors for manholes and appurtenances to be equal to 6-inch DIP cost at 10-foot maximum trench depth. Assumes ELA costs at 25% and contingency at 25%.
2. Assumes PS 10 proposed capacity is reduced to 200 gpm for the two-year storm event and 245 gpm for the five-year storm event due to the reroute of PS 30.

6.2.1.3.4 Pump Station 61

PS 61 contains two submersible pumps and has a design firm capacity of 150 gpm (the current tested firm capacity is 139 gpm). The pump station has sufficient capacity to convey the non-modeled flow projections included in the *SSS Characterization Report*; however, performance during wet weather events in 2015 indicated to the UG staff that the station has inadequate capacity (believed to be due to significant I/I within the pump station sewershed).

Increasing the capacity of PS 61 would require construction of a larger 6-inch diameter force main to handle the two-year and five-year storm event flows (the existing force main is 4-inch diameter). The estimated costs to complete the improvements to PS 61 are presented in Table 6-9.

Table 6-9: PS 61 Capacity and Force Main Improvements

Cost Item	Estimated Cost (2015 $)	
	Two-Year Storm Event	Five-Year Storm Event
Installation of new Force Main(1)	$140,000	$140,000
Capacity Improvements(2)	$150,000	$200,000
Total	$290,000	$340,000
Annual O&M Cost	$31,000	$32,000

Notes:
1. Costs estimates presented are based on the *UG Basis of Cost Manual*. Site adjustment factor for manholes and appurtenances were applied based on size of sewer, per *UG Basis of Cost Manual*.
2. Assumes proposed capacity is 300 gpm for the two-year storm event and 350 gpm for the five-year storm event.

6.2.1.4 Plant 20 Capacity Improvements

After flows from the PS 50 service area are rerouted north to the expanded Wolcott WWTP, the frequency of activation and volume discharged through the overflow at PS 6 will be reduced. Expanding Plant 20 hydraulic capacity from 14 mgd to 21 mgd (matching the maximum flow that can be pumped to the WWTP from PS 6 and PS 44) is anticipated to reduce even further the overflows at PS 6 for the design storm events for much of the planning period.

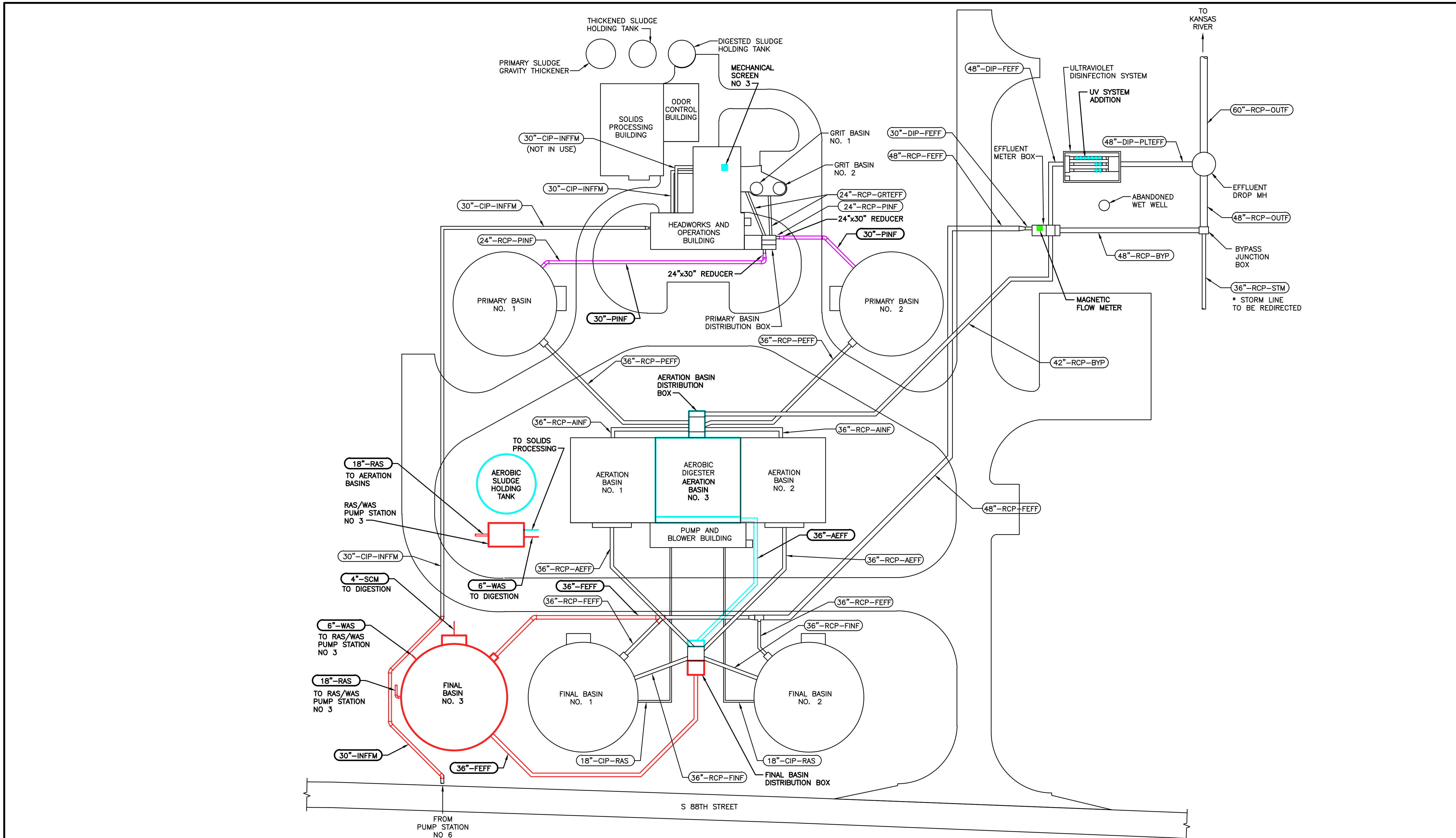
The modifications to increase plant hydraulic capacity to 21 mgd would increase the plant footprint within the existing plant site, but would not require expansion to adjacent sites. The most significant improvements involve the addition of a new final clarifier, aerobic digester, and an aerobic sludge-holding basin. The evaluation of Plant 20 capacity and the recommended improvements are described in detail in the *SSS Characterization Report*.

The following improvements would result in a 3:1 plant throughput based on projected flows, matching the maximum amount of flow that can currently be pumped from PS 6 and PS 44 (serving the nearby City of Edwardsville) to Plant 20:

- Install new bar screen and modify existing mechanical bar screen.
- Construct a new aeration basin distribution box to divide flow to three basins.
- Convert the existing aerobic digester to a third aeration basin.
- Modify the final basin distribution box to receive flow from the three aeration basins and divide flow to three final basins.
- Construct a new 90-foot diameter third final basin.
- Construct new RAS/WAS pump station.
- Upgrade the UV disinfection system.
- Construct new 60-foot diameter aerobic sludge holding tank.
- Construct new yard piping.
- Reroute or redirect storm sewer flow (a storm line at the plant site is connected to the plant effluent line).

Timing of the improvements listed above is primarily dependent on growth in the WWTP service area. Construction timing will need to be flexible since the capacity upgrade may not be necessary as soon as the conservative (high) future growth projections indicate. For this reason, the improvements will likely be constructed in multiple phases. The improvements listed above are currently planned to occur as part of the Recommended Plan presented in Section 9.0. Accordingly, the SSO reduction associated with the Recommended Plan assumes that these improvements have been completed.

A preliminary layout of the improvements to increase plant hydraulic capacity to 21 mgd is shown on Figure 6-4. The estimated cost for the Plant 20 capacity (21 mgd) upgrade is $7,400,000.



Abbreviations

AEFF = Aerobic Effluent
AINF = Aeration Influent
BYP = Bypass
CIP = Cast Iron Pipe
DIP = Ductile Iron Pipe
FEFF = Final Efeluent
FINF = Rinal Influent
GRTEFF = Grit Effluent
INFFM = Influent Forcemain
MH = Manhole
OUTF = Outfall
PEFF = Primary Effluent
PINF = Primary Influent
PLTEFF = Plant Effluent
RCP = Reinforced Concrete Pipe
RAS = Return Activated Sludge
SCM = Scum
STM = Storm
UV = Ultraviolet
WAS = Waste Activated Sludge

0 80 160
SCALE: 1" = 160'

Figure 6-4

Plant 20 Capacity Improvements
Preliminary Site Layout

The capacity improvements at Plant 20 are anticipated to further reduce overflows at PS 6 during the design storm events for much of the planning period. However, growth within the WWTP's service area is projected to eventually result in peak wet weather flows exceeding the capacity of PS 6, resulting in the need for an EFHB at the pump station.

The storage facilities are anticipated to be sited near the station in one EFHB sized to store excess flows for the design storm event. The two largest interceptors within the tributary area converge at the diversion structure upstream of PS 6, making this an optimal location to construct storage as peak wet weather flows from both interceptors could be diverted to one storage facility. Additionally, this is a rural area with vacant agricultural land adjacent to the pump station. Storage costs for future conditions (Year 2033) for a two-year and five-year storm event are presented in Table 6-10.

Table 6-10: Pump Station 6 EFHB Sizing and Cost Estimate

Cost Item	Two-Year Storm Event		Five-Year Storm Event	
	EFHB Volume (MG)	Estimated Cost (2015 $)	EFHB Volume (MG)	Estimated Cost (2015 $)
PS 6 Storage	0.6	$2,400,000	6.5	$18,400,000

Notes:

1. Costs assume storage in one above ground tank, estimated per the *UG Basis of Cost Manual*. There may be adequate land available to construct an earthen or concrete lined EFHB in lieu of the storage tank. Sizing and costs also assume no I/I removal and the PS 50 reroute has occurred.

6.2.2 Basins Tributary to Kaw Point WWTP

Improvement alternatives were developed to determine facility sizing to control SSOs for the two-year and five-year storm events in the SSS basins tributary to the Kaw Point WWTP for both existing and future conditions. According to the MARC population projections, growth within the SSS basins tributary to the Kaw Point WWTP is anticipated to remain stagnant. Some basins are anticipated to grow slightly while others are expected to decline in population. For those areas the population is predicted to decline, the populations were held constant in the model throughout the planning period. Holding those areas constant resulted in an overall increase in population of 1.5% for the basins tributary to the Kaw Point WWTP for the future conditions.

6.2.2.1 Pipe Capacity Improvements

As discussed in Section 2.0, the SSS system experienced surcharging for the two-year and five-year storm events above the allowable levels defined in the *SSE Work Plan* (surcharged less than 8-feet below the surface). System modeling indicates this results in SSOs or basement backups within the system. To alleviate the surcharging within these areas, pipe capacity improvements are necessary.

Capacity improvements were sized to convey peak flows within the pipe generated by the design storm event assuming all infrastructure has capacity upstream and downstream (i.e., no surcharging). The recommended pipe capacity improvement projects and associated costs are presented in Table 6-11.

Table 6-11: Pipe Capacity Improvement Projects Cost Estimates – Basins Tributary to Kaw Point WWTP

Project	Estimated Cost (2015 $)	
	Two-Year Storm Event	Five-Year Storm Event
Brenner Heights Creek Basin Capacity Improvements	$1,900,000	$4,100,000
Brenner Heights Tributary Basin Capacity Improvements	$1,100,000	$1,800,000
Brush Creek Basin Capacity Improvements	-	$200,000
Turner Creek Basin Capacity Improvements	$60,000	$100,000
Turkey Creek Basin Capacity Improvements	$130,000	$900,000

The costs above assume no I/I removal. However, it may be possible to realize minor cost reductions if I/I removal is achieved within these basins through system renewal efforts. It is anticipated that system rehabilitation and I/I removal efforts will be conducted within these basins prior to designing and constructing capacity related improvements.

6.2.2.2 Pump Station Capacity Improvements

As discussed in Section 2.0, several pump stations within the SSS system had inadequate capacity to convey peak flows during the two-year and five-year storm events. Surcharging occurred upstream of the pump stations and, in some cases, SSOs. The pump station improvements include either capacity improvements or construction of storage basins to store any flow above the pump station capacity.

6.2.2.2.1 Pump Stations 7 and 45

PS 7 and PS 45 convey flows from the western-most SSS basins tributary to the Kaw Point WWTP. These pump stations form an integrated pump station system. Flows from the Brenner Heights Creek, Brenner Heights Tributary, and Eddy Creek Basins flow to PS 45. Flows in excess of the PS 45 capacity are conveyed to PS 7 after surcharging approximately 14 feet within the wet well. PS 7 conveys flow from the Union Pacific Bottoms, Little Muncie Creek, and Muncie Creek Basins and the excess flow from PS 45. During the two-year storm event, flow surcharges above the allowable level upstream of PS 45 and overflows occur at PS 7.

Several alternatives were considered for reducing the surcharging and eliminating overflows in this area. These alternatives included:

- Upsize each pump station to convey peak flows.
- Consolidate pump stations to one pump station located at PS 7.
- Construct new gravity sewer from PS 45 to PS 7 and increase capacity of PS 7.
- Construct new gravity sewer from PS 45 to PS 7 and provide storage at PS 7.

The most cost effective alternative was determined to be the fourth alternative. This alternative includes installation of a gravity sewer from PS 45 to PS 7 to alleviate surcharging upstream of PS 45 and construction of an EFHB at PS 7 to store peak flows above the existing PS 7 capacity. The costs for the recommended improvements at PS 45 and PS 7 is presented in Table 6-12.

Table 6-12: PS 45 to PS7 Gravity Sewer and Pump Station 7 Storage Improvements Cost Estimate

Cost Item	Estimated Cost (2015 $)	
	Two-Year Storm Event	Five-Year Storm Event
Gravity Sewer from PS 45 to PS 7 (36-inch Diameter)	$1,600,000	$1,600,000
PS 7 EFHB	$800,000	$7,000,000

6.2.2.2.2 Pump Station 40

PS 40 conveys flow from the eastern half of the Argentine Basin. Modeling indicated that the pump station has inadequate capacity to convey the two-year storm event. Alternatives for this pump station considered a storage facility to contain excess wet weather flows and capacity improvements at the pump station. After evaluation of the alternatives, upsizing of the pump station was determined to be the most cost effective solution. The associated costs are presented in Table 6-13.

Table 6-13: Pump Station 40 Capacity Improvements Cost Estimate

Cost Item	Estimated Cost (2015 $)	
	Two-Year Storm Event	Five-Year Storm Event
PS 40 Capacity Improvements	$1,100,000	$1,800,000

6.2.2.2.3 Pump Station 18

PS 18 conveys the Barber Creek Basin flows east into the Turner Creek Basin. The force main is connected to the PS 5 force main. PS 18 does not have adequate capacity to convey the two-year storm event. The PS 18 site has an existing lagoon that is used for dewatering solids collected by vactor equipment in the collection system. The existing lagoon is being retrofitted as an EFHB to contain flows in excess of PS 18 capacity. The existing EFHB will provide approximately 300,000 gallons of storage, which is enough storage for the five-year storm event. The cost for the EFHB is presented in Table 6-14. This project is scheduled to begin construction in the Fall of 2016.

Table 6-14: Pump Station 18 Excess Flow Holding Basin Cost Estimate

Cost Item	Estimated Cost (2015 $)	
	Two-Year Storm Event	Five-Year Storm Event
PS 18 EFHB	$900,000	$900,000

6.2.2.2.4 Pump Station 28

PS 28 is located in the Eddy Creek Basin. Modeling indicated that the pump station has inadequate capacity to convey the five-year storm event. Alternatives for this pump station considered a storage facility to contain excess wet weather flows and capacity improvements at the pump station. After evaluation of the alternatives, upsizing of the pump station was determined to be the most cost effective solution. The associated costs are presented in Table 6-15.

Table 6-15: Pump Station 28 Capacity Improvements Cost Estimate

Cost Item	Estimated Cost (2015 $)	
	Two-Year Storm Event	Five-Year Storm Event
PS 28 Capacity Improvements	-	$700,000

6.2.2.2.5 Pump Station 21

PS 21 is located in the Turner Creek Basin. Modeling indicated that the pump station has inadequate capacity to convey the five-year storm event. Alternatives for this pump station considered a storage facility to contain excess wet weather flows and capacity improvements at the pump station. After evaluation of the alternatives, upsizing of the pump station was determined to be the most cost effective solution.

Table 6-16: Pump Station 21 Capacity Improvements Cost Estimate

Cost Item	Estimated Cost (2015 $)	
	Two-Year Storm Event	Five-Year Storm Event
PS 21 Capacity Improvements	-	$900,000

6.2.2.3 Non-Modeled Pump Station Improvements

Recommendations were developed for each of the non-modeled pump stations identified to be in need of capacity improvements. The magnitude of the required capacity increases were developed using projected peak wet weather flows based on the flow projection methodology presented in the *SSS Characterization Report*. Prior to any improvements, the UG plans to first perform a sanitary sewer evaluation study (SSES) to determine if the capacity issues can be addressed cost effectively through I/I reduction.

Costs were developed for both the two-year and the five-year storm events; however, both scenarios resulted in only a small variance in cost. Therefore, the costs presented in the following sub-sections were developed for the five-year storm event.

6.2.2.3.1 Pump Station 23 and Pump Station 24

PS 23 and PS 24 are located within the Little Muncie Creek Basin. The existing pumps at PS 23 are not sized adequately for standard sanitary sewer service and need to be replaced. PS 23 conveys flow via a force main to PS 24. Flow projections indicate that neither pump station has adequate capacity for the two-year storm event. Alternatives were evaluated for upsizing these pump stations or combining flows via new gravity sewers. It was determined based on depth of construction that upsizing each pump station is more cost effective. The costs for the capacity improvements are provided in Table 6-17.

Table 6-17: Pump Station 23 and 24 Capacity Improvements Cost Estimate

Pump Station ID	Design Firm Capacity (gpm)	Improved Capacity Five-Year Storm Event (gpm)[1]	Capacity Improvement Estimated Cost (2015 $)	Annual PS O&M Cost
23	100	300	$300,000	$31,000
24	329	1,025	$1,000,000	$43,500

Notes:

1. Proposed capacity to convey projected flows for five-year storm event under future (Year 2033) conditions.

6.2.2.3.2 Pump Station 62

PS 62 is located within the Turner Creek Basin. Flow projections indicate the pump station does not have adequate total capacity to convey the two-year storm event. Improvements considered at PS 62 include replacement with a gravity sewer and upsizing of the existing pump station. It was determined that a gravity sewer was not feasible. Upsizing the pump station to convey the design event is; therefore, recommended. The cost for upsizing PS 62 is presented in Table 6-18.

Table 6-18: Pump Station 62 Capacity Improvements Cost Estimate

Pump Station ID	Design Firm Capacity (gpm)	Improved Capacity Five-Year Storm Event (gpm)[1]	Capacity Improvement Estimated Cost (2015 $)	Annual PS O&M Cost
62	168	740	$700,000	$37,600

Notes:
1. Proposed capacity to convey projected flows for five-year storm event under future (Year 2033) conditions.

6.2.2.3.3 Pump Station 29

PS 29 is located within the Eddy Creek Basin. Flow projections indicate the pump station does not have adequate capacity to convey the two-year storm event. Improvements considered at PS 29 include replacement with a gravity sewer and upsizing of the existing pump station. It was determined upsizing of the pump station to convey the design event is the most cost effective alternative. The cost for upsizing PS 29 is presented in Table 6-19.

Table 6-19: Pump Station 29 Capacity Improvements Cost Estimate

Pump Station ID	Design Firm Capacity (gpm)	Improved Capacity Five-Year Storm Event (gpm)[1]	Capacity Improvement Estimated Cost (2015 $)	Annual PS O&M Cost
29	100	280	$300,000	$30,500

Notes:
1. Proposed capacity to convey projected flows for five-year storm event under future (Year 2033) conditions.

6.2.2.3.4 Pump Station 57

PS 57 is located within the Turner Creek Basin. Flow projections indicate the pump station does not have adequate total capacity to convey the two-year storm event. Improvements were considered at PS 57 and it was determined the force main was not properly sized to convey the design flows. A new 6-inch diameter force main is required to bring the pump station up to its design capacity. The cost for a new 6-inch diameter force main at PS 57 is presented in Table 6-20.

Table 6-20: Pump Station 57 Force Main Capacity Improvements Cost Estimate

Pump Station ID	Force Main Diameter	Force Main Length	Estimated Cost (2015 $)
57	6 inches	1,520 feet	$700,000

6.2.2.3.5 Pump Station 25 and Pump Station 26

PS 25 and PS 26 are located within the Eddy Creek Basin. PS 26 conveys flow via a force main and gravity sewer to PS 25. Flow projections indicate that neither pump station has adequate capacity for the two-year storm event. The costs for the pump station capacity improvements are provided in Table 6-21.

Table 6-21: Pump Stations 25 and 26 Capacity Improvements Cost Estimate

Pump Station ID	Design Firm Capacity (gpm)	Improved Capacity Five-Year Storm Event (gpm)[1]	Capacity Improvement Estimated Cost (2015 $)	Annual PS O&M Cost
26	103	309	$300,000	$32,300
26	120	523	$500,000	$36,900

Notes:
1. Proposed capacity to convey projected flows for five-year storm event under future (Year 2033) conditions.

6.2.2.3.6 Pump Station 27

PS 27 is located within the Eddy Creek Basin. Flow projections indicate the pump station does not have adequate capacity to convey the two-year storm event. Improvements considered at PS 27 include replacement with a gravity sewer flowing to PS 28 and upsizing of the existing pump station. It was determined upsizing of the pump station to convey the design event is the most cost effective alternative. The cost for upsizing PS 27 is presented in Table 6-22.

Table 6-22: Pump Station 27 Capacity Improvements Cost Estimate

Pump Station ID	Design Firm Capacity (gpm)	Improved Capacity Five-Year Storm Event (gpm)[1]	Capacity Improvement Estimated Cost (2015 $)	Annual PS O&M Cost
27	200	343	$300,000	$35,200

Notes:
1. Proposed capacity to convey projected flows for five-year storm event under future (Year 2033) conditions.

6.2.2.3.7 Pump Station 55

PS 55 is located within the Eddy Creek Basin. Flow projections indicate the pump station does not have adequate capacity to convey the two-year storm event. The only improvement option at PS 29 is upsizing of the existing pump station. The cost for upsizing PS 55 is presented in Table 6-23.

Table 6-23: Pump Station 55 Capacity Improvements Cost Estimate

Pump Station ID	Design Firm Capacity (gpm)	Improved Capacity Five-Year Storm Event (gpm)[1]	Capacity Improvement Estimated Cost (2015 $)	Annual PS O&M Cost
55	150	208	$200,000	$31,700

Notes:
1. Proposed capacity to convey projected flows for five-year storm event under future (Year 2033) conditions.

6.3 Estimated Costs

The specific projects and capital costs associated with provided a two-year and five-year storm event level of service are shown in Table 6-24.

Table 6-24: SSO Remediation Plan Alternative Estimated Project Costs

Project	Basin(s)	Estimated Cost (2015 $)	
		Two-Year Storm Event	Five-Year Storm Event
Wolcott WWTP (Phase 1 and Phase 2) and EFHB	Connor Creek	$53,500,000	$53,500,000
Lower Connor Creek Interceptor and Pump Station 50 Elimination	Connor Creek	$5,800,000	$5,800,000
PS 15 Decommission and Gravity Sewer	Connor Creek	$520,000	$520,000
PS 76 and 77 Decommission and Gravity Sewer	Connor Creek	$270,000	$270,000
Mill Creek Basin Capacity Improvements	Mill Creek	$2,300,000	$4,200,000
Little Turkey Tributary North Basin Capacity Improvements	Little Turkey Tributary North	$30,000	$600,000
PS 8 Capacity Improvements	Mill Creek	$24,000	$29,000
PS 11 Capacity Improvements	Little Turkey Tributary North	$20,000	$40,000
PS 10 and 30 Capacity and Force Main Improvements	Marshall Creek	$230,000	$290,000
PS 61 Capacity and Force Main Improvements	Honey Creek	$290,000	$340,000
Plant 20 Capacity Upgrade	Timmons Creek	$7,400,000	$7,400,000
PS 6 Storage	Little Turkey Tributary South	$2,400,000	$18,400,000
Brenner Heights Creek Basin Capacity Improvements	Brenner Heights Creek	$1,900,000	$4,100,000
Brenner Heights Tributary Basin Capacity Improvements	Brenner Heights Tributary	$1,100,000	$1,800,000
Brush Creek Basin Capacity Improvements	Brush Creek	$0	$200,000
Turner Creek Basin Capacity Improvements	Turner Creek	$60,000	$100,000
Turkey Creek Basin Capacity Improvements	Turkey Creek	$130,000	$900,000
Pump Station 7 Storage	Muncie Creek	$800,000	$7,000,000
Gravity Sewer from PS 45 to PS 7	Brenner Heights Creek	$2,000,000	$2,000,000
Pump Station 40 Capacity Improvements	Argentine	$1,100,000	$1,800,000
Pump Station 18 Storage	Barber Creek	$900,000	$900,000
Pump Station 28 Capacity Improvements	Eddy Creek	$0	$700,000
Pump Station 21 Capacity Improvements	Turner Creek	$0	$900,000

Project	Basin(s)	Estimated Cost (2015 $)	
		Two-Year Storm Event	Five-Year Storm Event
Pump Station 23 and 24 Capacity Improvements	Little Muncie Creek	$1,300,000	$1,300,000
Pump Station 62 Capacity Improvements	Turner Creek	$700,000	$700,000
Pump Station 29 Capacity Improvements	Eddy Creek	$300,000	$300,000
Pump Station 57 Force Main Capacity Improvements	Turner Creek	$700,000	$700,000
Pump Station 25 and 26 Capacity Improvements	Eddy Creek	$800,000	$800,000
Pump Station 27 Capacity Improvements	Eddy Creek	$300,000	$300,000
Pump Station 55 Capacity Improvements	Eddy Creek	$200,000	$200,000
Total Estimated Cost (2015 $)		$85,100,000	$116,100,000

7.0 FINANCIAL CAPABILITY

7.1 UG's Commitment

This section summarizes the assumptions, analysis, and findings associated with assessing the UG's financial capability to fund the necessary improvements to comply with the CWA and *CSO Control Policy*. The assessment included the following efforts:

- Development and analysis of additional socioeconomic information consistent with the *Financial Capability Assessment Framework for Municipal Clean Water Act Requirements* to provide a more complete and accurate picture of the UG's financial capability.
- Development of an integrated financial model, including the costs associated with providing wastewater and stormwater utility services to the UG service area.
- Completion of a Financial Capability Assessment (FCA), following the guidelines established by the *Combined Sewer Overflows – Guidance for Financial Capability Assessment and Schedule Development*.

The assessment of financial capability as described in the EPA guidance is a general snapshot of affordability and does not present a true picture of the heavy financial burden currently existing for the UG's customers. The EPA's reliance on the median household impact does not effectively capture the economic hardship that may be imposed on the lower-income households in the community. It is important to note that the UG's use of the EPA guidance in the preparation of this FCA is not an acknowledgment that the UG believes the methodology in the guidance accurately predicts a community's financial capability to meet its CWA and other regulatory obligations.

The residents of KCK and the WPCD have limited resources, so the investments they make need to return the greatest public benefits. Investments to address sewer overflows will impose significant financial hardships on the community, which will not only strain fiscal capacity, but may also displace other important community investments and priorities. To fund overflow controls will require that wastewater bills grow faster than household incomes and the general rate of inflation for several more decades, resulting in even greater affordability challenges, particularly for lower-income households.

7.2 Information Relevant to Financial Capability

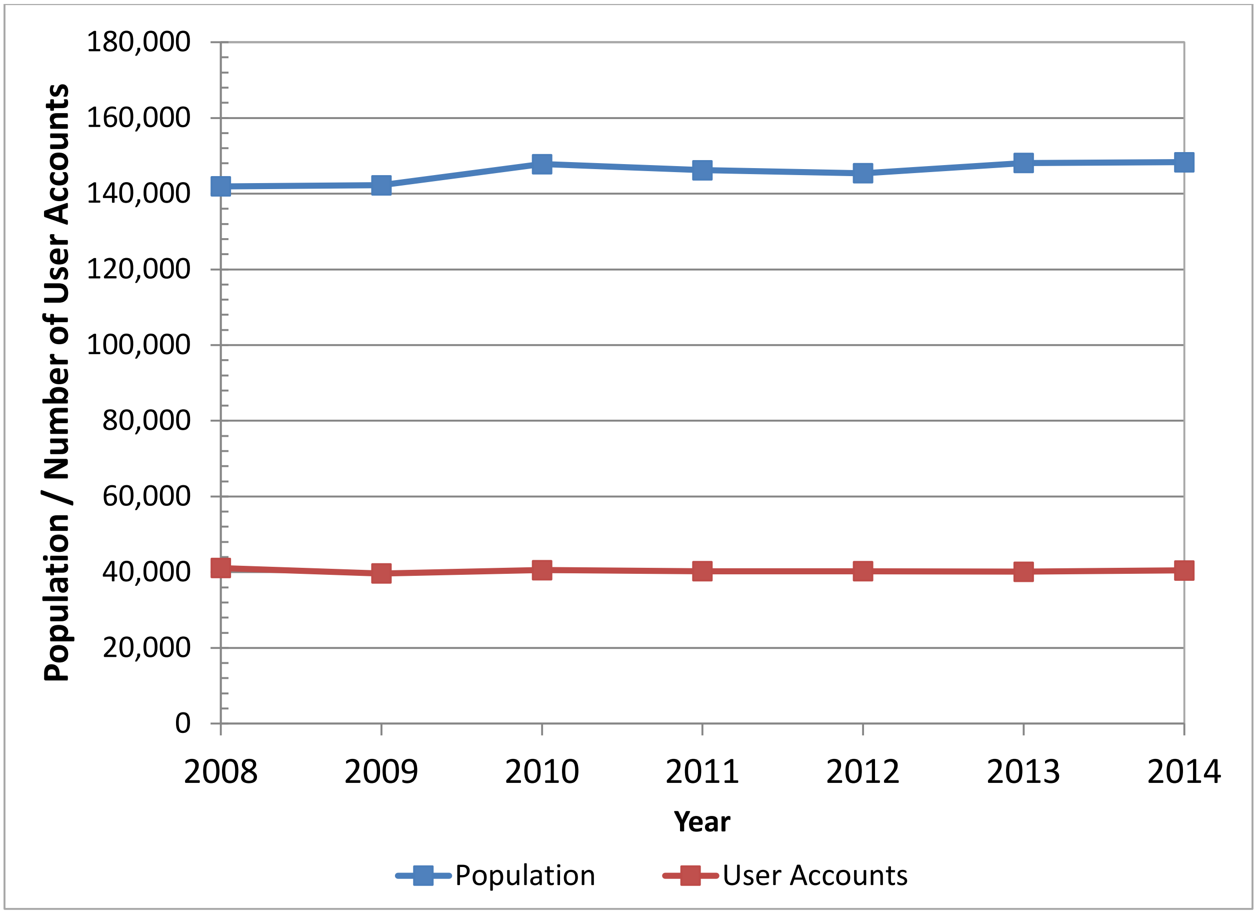
7.2.1 Introduction

In its *Financial Capability Assessment Framework for Municipal Clean Water Act Requirements*, the EPA indicated financial capability is "on a continuum." As such, a rigid interpretation of the financial capability matrix in the EPA FCA guidance is discouraged. As a result, supplemental information is provided herein that shows the UG service area is disadvantaged across a wide variety of socioeconomic indicators beyond those included in the FCA. This information indicates funding capital projects to meet the *CSO Control Policy*, even at the lower end of overflow control scenarios considered in this IOCP, would create a very high burden for a significant number of households in the service area.

7.2.2 Population

The population in KCK reported in the 2010 census was 147,798. This was an increase of less than 1% from the 2000 census, which reported population of 146,866. Since 2008, the KCK population and user accounts have remained flat as shown on Figure 7-1.

Figure 7-1: Population and User Account Trends



Sources: U.S. Census Bureau American Community Survey, 2008-2014, 1-Year Estimates and UG Finance Department.

Although the total population has remained flat, there has been an apparent shift in the population location from the eastern (CSS) part of the county to the western (SSS) part of the county. This has partially resulted in over 6,000 vacant lots in the eastern area of the county. Although the UG is aggressively working on addressing vacant properties in hopes of improving finances, the vacant lots have serious impacts on property tax income. As important, the population shift is requiring new infrastructure in the western service area without any increase in customer base to help pay for it.

The KCK and WyCo population is disadvantaged compared to the state and national populations for a number of key socioeconomic metrics. For example, as shown in Table 7-1, the people with income below the poverty level and without health insurance in KCK is almost double that of the state and national populations. There is also no racial majority in KCK with the Hispanic and black populations comprising almost 70% of the total population. There has been a long history of WyCo welcoming immigrants; more refugees are accepted into the county than all Kansas counties combined. However, the first generation typically has minimal education and financial resources.

Table 7-1: Community Profile

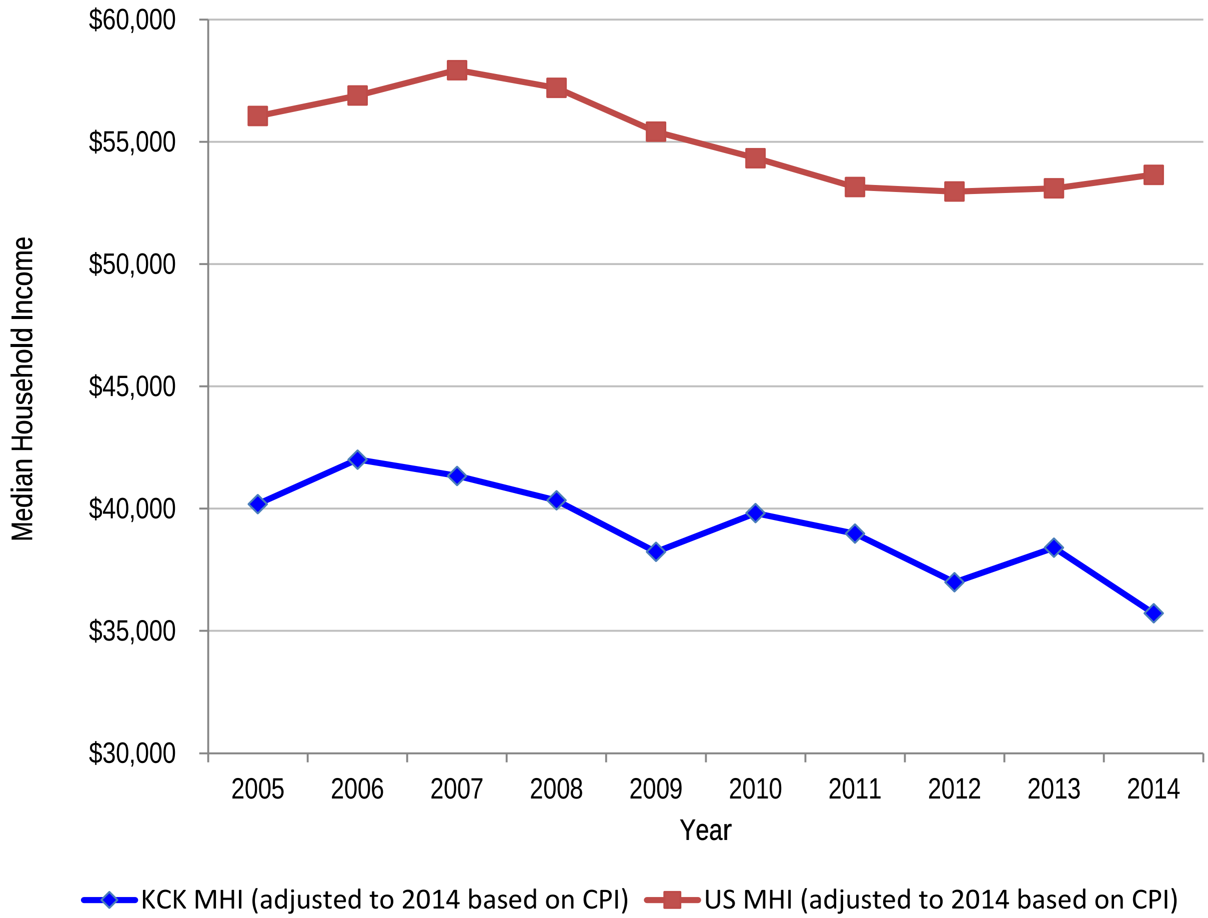
Indicator[1]	Kansas City, Kansas	Wyandotte County, Kansas	State of Kansas	United States
Percent Unemployed[2]	6.1%	6.1%	3.4%	4.5%
Median Household Income	$35,724	$36,637	$52,504	$53,657
No Health Insurance Coverage[3]	22.7%	21.6%	10.2%	11.7%
People with Income Below Poverty Level	25.1%	24.2%	13.6%	15.5%
Households with Income Below $25,000	35.6%	34.4%	22.0%	23.1%
Renter-Occupied Housing Units	35.6%	34.4%	22.0%	23.1%
Hispanic or Latino Population	44.1%	43.2%	33.4%	36.9%
Black or African American Population	24.8%	23.4%	5.9%	12.7%

Notes:
1. *2014 American Community Survey 1-Year Estimates*, U.S. Census Bureau.
2. Civilian labor force.
3. Civilian non-institutionalized population.

7.2.3 Income Levels

The 2014 national median household income ($53,657) is over 30% higher than the median household income (MHI) in KCK ($35,725). A comparison of the MHI trend in KCK and the US since 2005 (adjusted to 2014 based on the Consumer Price Index [CPI]) is shown on Figure 7-2. The adjusted MHI in KCK continues to decrease similar to the national trend. Accordingly, increases in wastewater and stormwater bills will not be offset by increases in household income.

Figure 7-2: Comparison of Median Household Income



Source: U.S. Census Bureau American Community Survey, 2014, 1-Year Estimates.

In addition to comparing unfavorably to the national population, KCK residents have lower income than residents in other Kansas cities. As shown in Table 7-2, data from the League of Kansas Municipalities indicates the MHI and per capita income in WyCo is among the lowest in the state. Also, the debt burden per capita is amongst the highest in the state.

Table 7-2: Community Income Rankings

Indicator	Kansas City, Kansas	Wyandotte County, Kansas
Debt Burden per Capita (Total Bonded Indebtedness)[1]	$7,410 1st Highest of 25[1] 5th Highest of 626[2]	$109 70th Highest of 105[3]
Median Household Income[2]	$38,073 20th Lowest of 25[1] 411th Lowest of 626[2]	$39,326 95th Lowest of 105[3]
Per Capita Income[2]	$18,425 24th Lowest of 25[1] 474th Lowest of 626[2]	$18,753 105th Lowest of 105[3]

Source: "Kansas Tax Rate & Fiscal Data Book," 2015 Edition, League of Kansas Municipalities.
Notes:
1. Rank amongst State of Kansas 1st Class Cities.
2. Rank amongst all State of Kansas Cities.
2. Rank amongst all State of Kansas Counties.

Income levels were also reviewed across different types of households to identify potentially vulnerable populations. As indicated in Table 7-3, there is considerable difference between income levels for renter-occupied and owner-occupied households and between elderly and all households.

Table 7-3: Median Household Income by Household Type

Household Type	Median Household Income (2014)
All Households	$38,073
Elderly Households	$32,631
Renter-Occupied	$25,659
Owner-Occupied	$50,876

Source: U.S. Census Bureau American Community Survey, 2010-2014, Five-Year Estimates and 2014, One-Year Estimates.

There is also significant income variation spatially as indicated on Figure 7-3. The majority of low-income residents in WyCo live within the CSS area, which also has the oldest wastewater infrastructure.

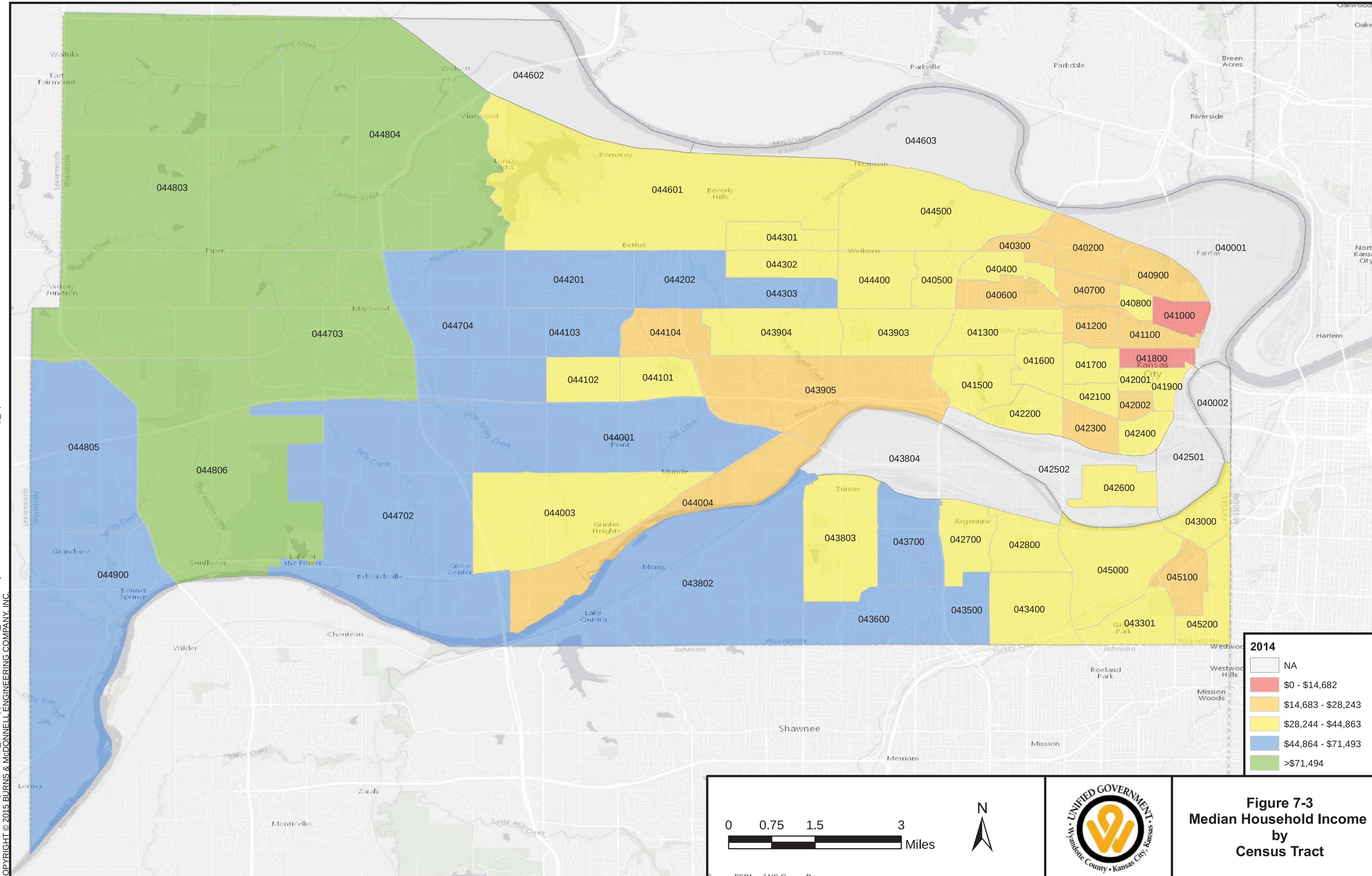


Figure 7-3
Median Household Income
by
Census Tract

As indicated in the *Affordability Assessment Tool for Federal Water Mandates*, MHI can be a misleading indicator for these reasons:

- MHI is a poor indicator of economic distress and bears little relationship to poverty or other measures of economic need within a community.
- MHI does not capture impacts across diverse populations.
- MHI provides a “snapshot” that does not account for the historical and future trends of a community’s economic, demographic, and/or social conditions.
- MHI does not capture impacts to landlords and public housing agencies.
- The RI does not fully capture household economic burdens.

7.2.4 Income Distribution

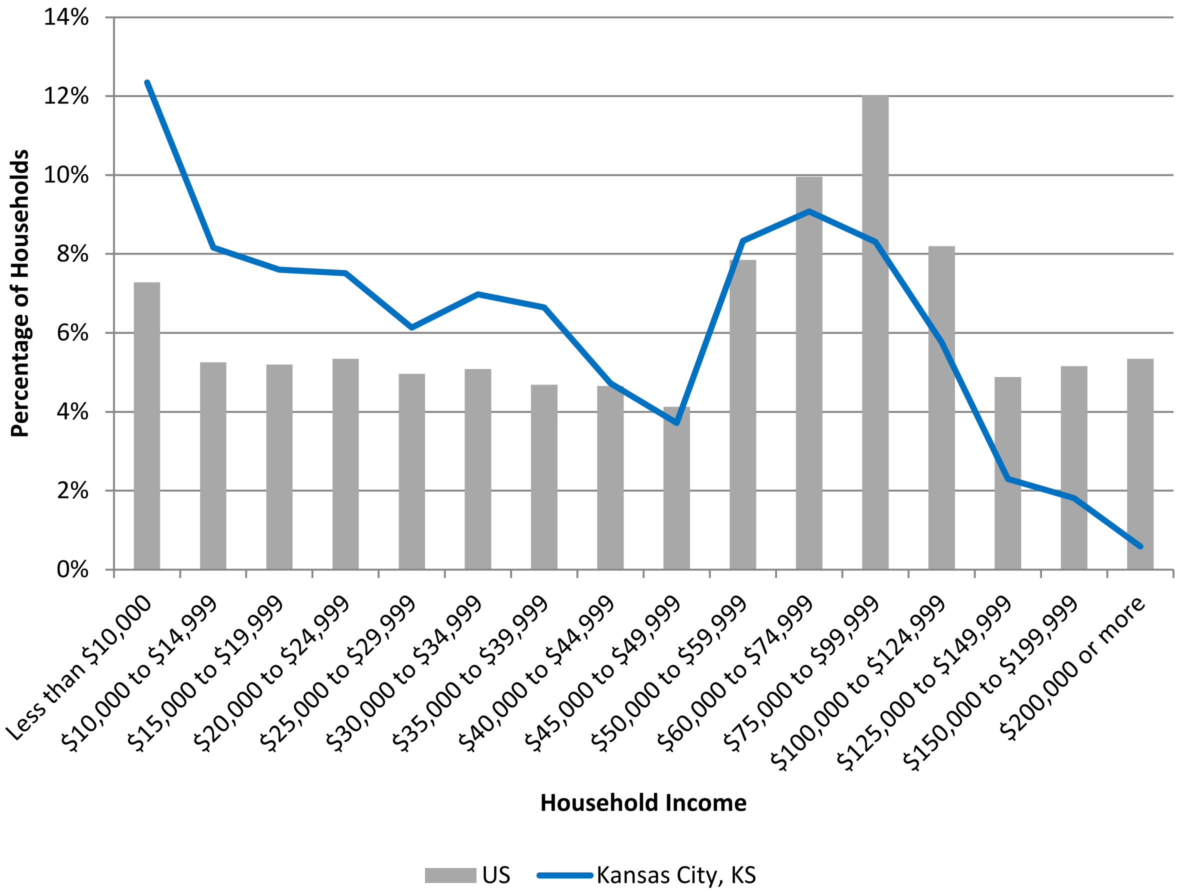
Many cities, including KCK, have incomes that are less centered on the median than across the United States as a whole. This results in more households being adversely impacted by increasing wastewater bills if the income distribution is unevenly distributed toward the lower levels. The distribution of income in KCK is higher in lower income groups and lower in higher income groups when compared to the national averages. Table 7-4 and Figure 7-4 show a comparison of income distribution between KCK and the US in 2014. The table shows the MHI and upper quintile limits, i.e., the income level that defines the upper end of the quintile.

Table 7-4: Median Household Income Upper Quintile Limits and Median Household Income

	Upper Quintile Limits (2014)		Median Household Income (2014)
Population Quintile	KCK	United States	KCK
Lowest Quintile	$14,682	$21,909	$7,379
Second Quintile	$28,243	$42,004	$21,111
Third Quintile	$44,863	$67,650	$35,559
Fourth Quintile	$71,493	$109,108	$57,195
Lower Limit of Top 5%	$122,529	$203,671	$110,652

Source: U.S. Census Bureau American Community Survey, 2014, One-Year Estimates.

Figure 7-4: Income Distribution in KCK and the United States

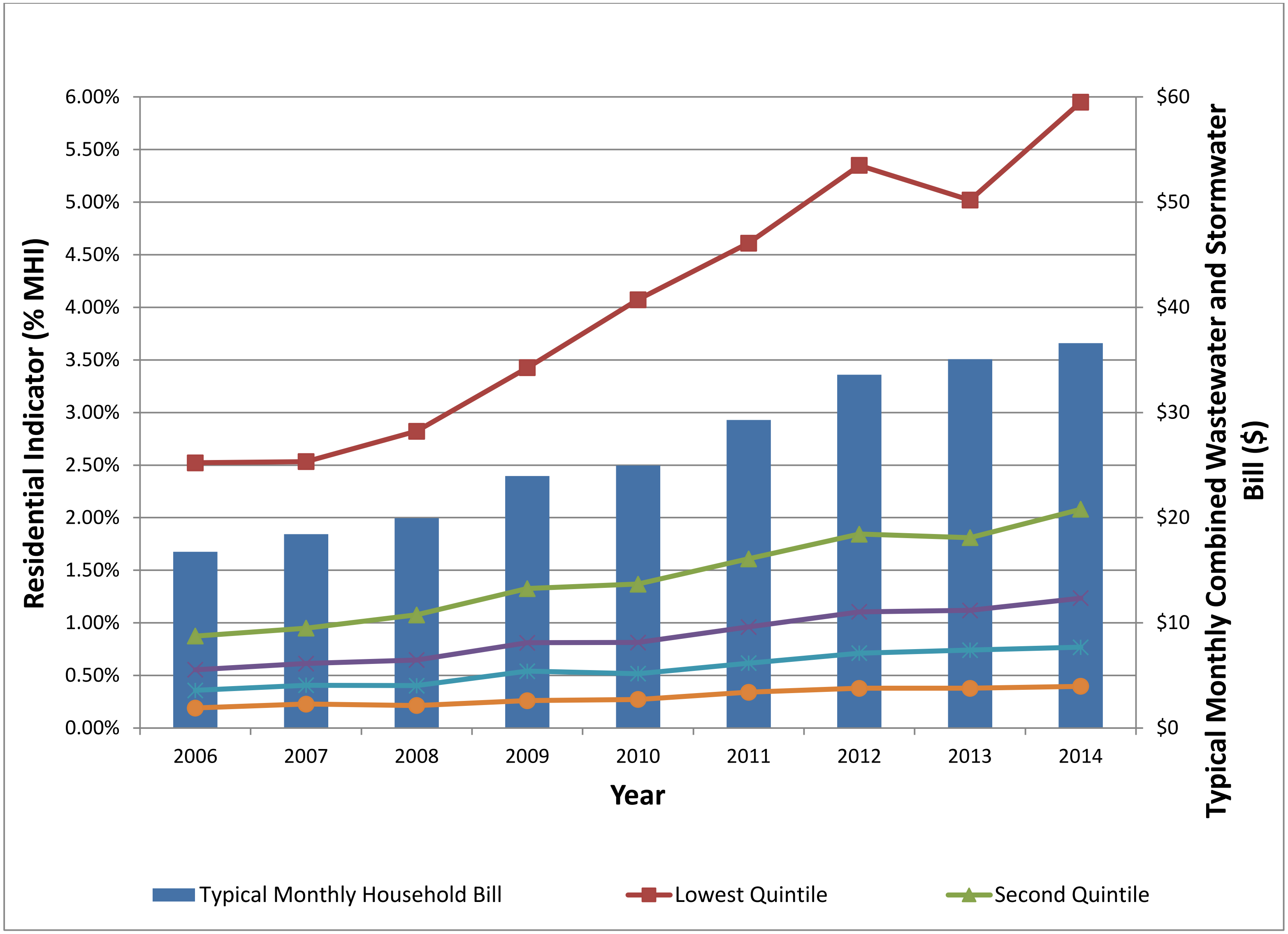


Source: U.S. Census Bureau American Community Survey, 2014- One Year Estimates.

Across all quintiles, the household income is substantially lower in KCK, as compared to national levels. The data reinforces that citywide MHI does not reflect a typical household and a much higher percentage of residents would be adversely impacted by increased wastewater bills compared to communities with a more equal and centrally clustered income distribution.

The impacts to difference households is shown vividly on Figure 7-5. In this figure, the typical monthly combined wastewater and stormwater bill is compared to that as a percent of MHI over the last nine years. In 2014, the combined annual bill was 1.23% of the community-wide MHI. However, for the second and lowest quintile populations, this results in 2.08% and 5.95% of the quintile, respectively.

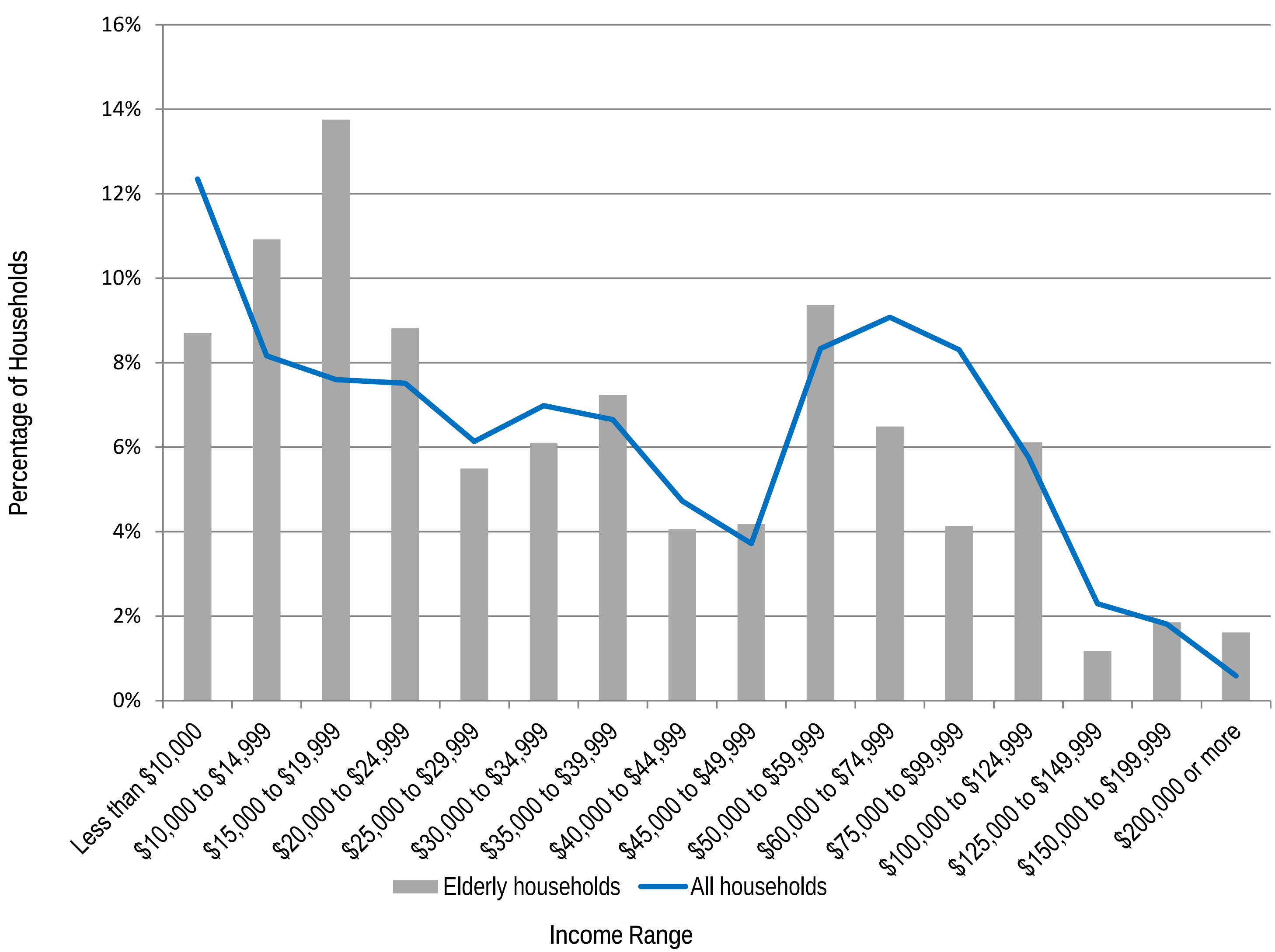
Figure 7-5: Historic Residential Indicators - Quintile Comparisons



Sources: Unified Government of Wyandotte County Finance Department, U.S. Census Bureau 2006-2014 American Community Survey One-Year Estimates

The evaluation of income distribution across different household types can help to identify vulnerable populations within a community. Figure 7-6 shows the income distribution across elderly households compared to all households in the community. More striking is that over 40% of all renters in the community (approximately 9,000 households) earn less than $20,000 per year.

Figure 7-6: Income Distribution in Elderly Households and All Households



Source: U.S. Census Bureau American Community Survey, 2014, One Year Estimates

7.2.5 Poverty Rates

Poverty rates are another indicator of economic need. As shown in Table 7-1, poverty rates for KCK and WyCo are significantly higher than state and national levels. This relationship is true when examining either all persons or those 18 years of age or older. Within the 18 years of age or older segment, the poverty rate for KCK is nearly two times the national average.

7.2.6 Unemployment

Although unemployment figures vary (between the U.S. Census Bureau and the Kansas Department of Labor, for example), unemployment levels for WyCo and KCK are consistently higher than state and national levels. As indicated in Table 7-1, the percentage of unemployed residents (civilian labor force) was 6.1% compared to 4.5% nationally. This comparison was particularly evident during the recent economic crisis, where the local unemployment levels were substantially higher than national levels. However, even in the last two years, which have witnessed improved unemployment indicators, it is clear the UG service area population is disadvantaged regarding unemployment levels.

7.2.7 Owner Occupancy Rate

With relatively higher unemployment rates and a higher proportion of its citizens at or below the poverty level, it stands to reason that home ownership in the UG service area is likely to be lower, and the number of renters higher, than in other areas of the country. Overall, the level of renter-occupied homes is higher in WyCo and KCK compared to national levels.

7.2.8 Health

As reported in the March 22, 2016, UG ENews Source Newsletter, the seventh annual County Health Rankings & Roadmaps ranked Wyandotte County last for "healthiest" counties in the state of Kansas. The rankings compare counties on more than 30 factors that influence health, including education, housing, employment, smoking, access to healthy food, teen birth rates, crime, physical inactivity, and others. As indicated in the *Affordability Assessment Tool for Federal Water Mandates*, an effective reduction in disposable income among low-income households may adversely affect already present health challenges.

7.2.9 Average Water and Wastewater Bills

Wastewater service is just one of several basic necessities that influence the economic burden and nondiscretionary spending of a household. In July 2010, the Board of Public Utilities (BPU) increased base rates for electric and drinking water services in the UG service area by about 7% and 8%, respectively. Electric rates were also increased 7% in 2011, 2012, and 2013. Water rates were also increased 7% in 2012 and 2013.

7.2.10 Other Challenges

In recent years, downtown KCK has struggled to build a strong local economy. For example, the EPA's recent office relocation in 2012 from their downtown setting to an almost rural suburban setting in Lenexa, Kansas has subjected KCK to an economic blow. The EPA's decision to move offices removed over 600 full time jobs from the KCK downtown area.

In addition to local economic concerns and affordability of additional sewer overflow controls, the UG has two significant additional concerns relating to regional competitiveness. Locally and throughout the region, numerous large utilities are implementing large, long-term sewer improvements, including Kansas City, St. Joseph, and Springfield, Missouri; Omaha, Nebraska; and Johnson County, Kansas. For example, the

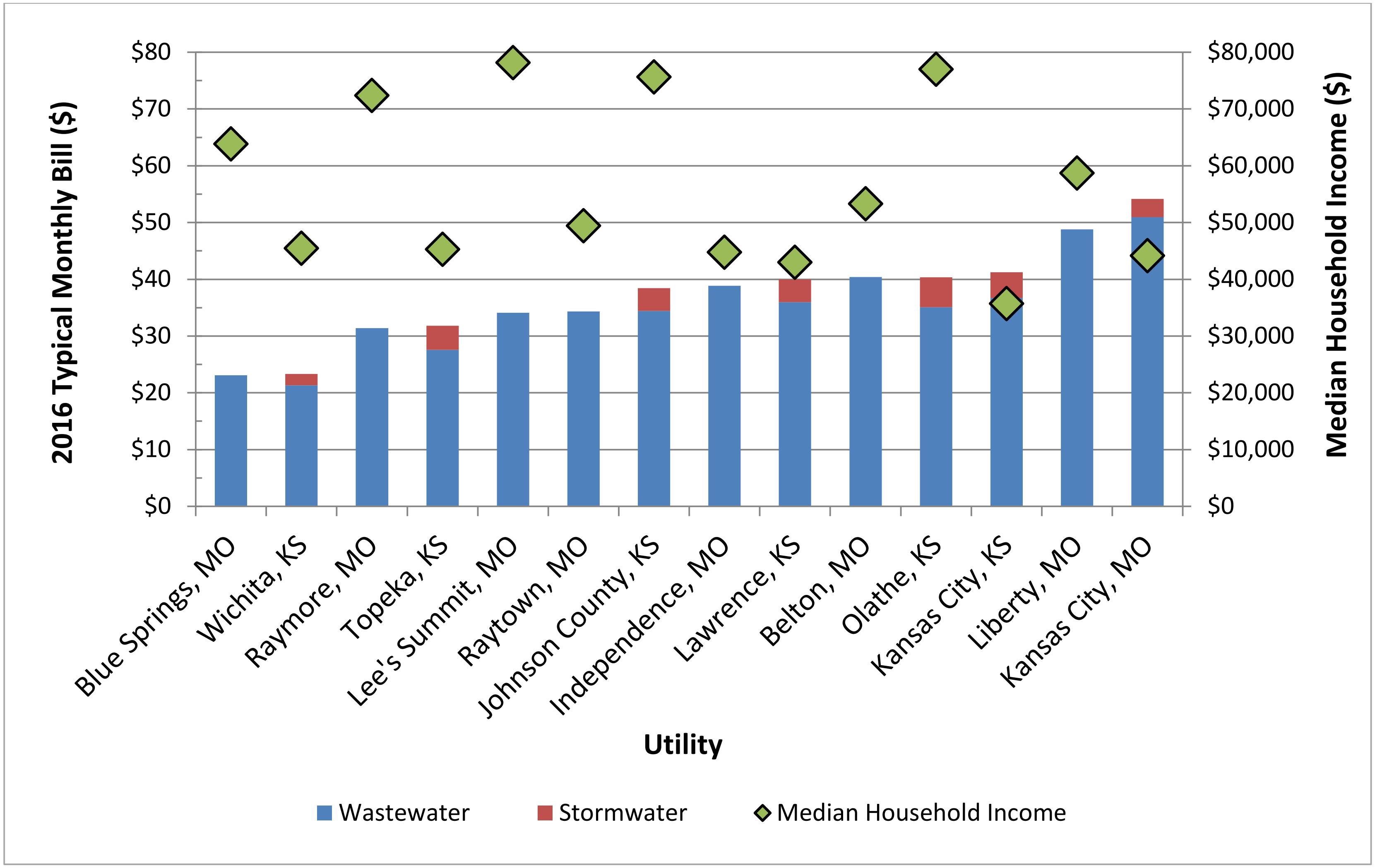
Kansas City, Missouri, Water Services Department capital program investment is anticipated to be over $7 billion between 2016 and 2035. This is the same time period that the UG will be constructing similar sewer improvements. These programs utilize many of the same engineering and construction firms. Thus, the UG is concerned that the local and regional engineer and construction contractor capacity and availability will result in construction cost escalation.

Second, the UG is already one of the highest debt burden per capita communities in Kansas. It is well known that addressing CSOs is a national concern that can severely financially affect communities and recent CSO consent decree extensions related to financial capability reinforce this fact. Locally, the KCMO Overflow Control Program has resulted in Johnson County, Kansas, and Liberty, Missouri, (two significant KCMO wholesale customers) to move forward with new/expanded WWTPs due to the higher rates being charged by KCMO to comply with overflow control requirements resulting in a significant reduction in customer base. This will further burden the KCMO community, another disadvantaged community that is experiencing financial difficulties associated with addressing CSOs. The UG fears the continual (decades) rate increases required to fund an overflow control program will discourage new businesses from building in the city when new jobs and taxes from these businesses are so desperately needed.

7.2.11 Conclusions

The UG faces many significant challenges in being able to increase rates for an extended period of time at likely twice (or more of) the rate of inflation and income growth for its ratepayers. Required sewer improvements will come at the expense of significant other social needs within the UG. This is very evident in Figure 7-7. The typical monthly bill for KCK customers is towards the upper end compared to several other regional communities. However, the MHI of KCK residents is significantly lower than the other regional communities.

Figure 7-7: Regional Typical Monthly Bill and Household Income Comparisons



Sources: Blue Springs, Missouri Website: Water and Sewer Utility Billing. Raymore, Missouri Website: City of Raymore Water Rates. Topeka, Kansas Website: Utilities Rates. City of Lee's Summit Website: Customer Service: Rates. Raytown, Missouri Website: Sewer Billing Information. City of Independence Website: Water Pollution Control: Rates. Lawrence, Kansas Website: Utility Billing Rates. Belton, Missouri Website: Water and Sewer Rates. City of Olathe Government Offices. Kansas City, Kansas Government Offices. Liberty, Missouri Website. Kansas City, Missouri Website: Water Rate Book - Web Version 2015. Unified Government of Wyandotte County Finance Department. U.S. Census Bureau: 2014 American Community Survey 1-Year Estimates.

7.3 Financial Model

7.3.1 Introduction

A financial model was developed for the integrated wastewater and stormwater utilities to perform the mathematical, financial, and economic calculations necessary to analyze the financial impacts of various overflow control scenarios.

7.3.2 Methodology and Assumptions

Several key assumptions and constraints were built into the financial model and applied to all scenarios evaluated as detailed below. Key financial data was obtained from the UG utility financial records including the Capital Maintenance and Improvement Plan (CMIP) and Comprehensive Annual Financial Report (CAFR).

7.3.2.1 Rate Schedule

The UG's actual monthly base charges and unit charges were used in development of the financial model. Projected monthly base charges and unit charges were both increased by approximately the same annual percentage user rate during the scenario plan periods.

7.3.2.2 Sewer Revenues

The number of residential and commercial non-food consumption (class I) customers in 2014 was assumed to increase by 0.25% annually during the scenario plan periods. The UG Land Use and Planning Department provided information used to forecast 20-year population and residential customer growth as detailed in the *SSS Master Plan*. To be conservative, approximately 60% of the forecasted growth was used in the financial model.

The number of commercial-food consumption and industrial (class II and III) customers was assumed to be equal to the number of class II and III customers in 2014, respectively, during the scenario plan periods.

The water volume use per account for class I customers was assumed to remain at the 2014 level of 5.6 hundred cubic feet (ccf) per month during the plan periods. Although the recent trend has been that water use per customer has dropped, we assume that the usage will not continue to drop much beyond this level. The volume use per account for class II and III customers was also assumed to remain at 2014 levels during the plan periods. If these aggressive assumptions are not borne out, rate increases will have to be even higher than anticipated.

Other sewer revenue is obtained from septic dumping fees, low-pressure sewer fees, other fees, permits and licenses, miscellaneous, tax revenue, and interest earnings. This revenue was projected to remain at the 2016 budgeted levels of approximately $1 million per year during the plan periods.

Increases in revenue result from annual sewer rate increases and the 0.25% increase in class I customer accounts. For each scenario, modeled user rate increases may vary.

7.3.2.3 Stormwater Revenues

Consistent with the increase in class I customers, it is assumed that the 2016 stormwater fund revenue will increase 0.25% annually during the plan periods. Other stormwater revenue is obtained from grants, miscellaneous, and interest earnings. This revenue was projected to remain at the 2016 budgeted levels ($13,700 per year).

Increases in revenue result from annual stormwater fee increases and the 0.25% increase in class I customer accounts. Stormwater fee increases were the same for all scenarios.

7.3.2.4 Sewer Operation and Maintenance Costs

The sewer fund operation and maintenance costs include personnel costs, maintenance and utilities costs, and transfers. The 2016 personnel cost budget was increased 3% annually. An additional $1 million, $900,000, and $200,000 in additional personnel costs were added in 2017, 2021, and 2026, to account for anticipated increases in staff. Additional staff is necessary to improve administration and operation of the utility, provide staffing for the expanded Wolcott WWTP, increase maintenance staff due to future growth of the system and anticipated retirements, and increased stormwater utility needs.

Maintenance and utilities costs were assumed to increase 3% annually above the 2016 budgeted amount due to general inflation. Additional maintenance and utilities costs were assumed equal to 0.25% of the wastewater capital improvements spending. Additional O&M expenses include operation of the expanded Wolcott WWTP and monitoring of the proposed SCADA improvements.

Indirect costs were assumed equal to the 2016 budgeted amount for the duration of the scenario periods.

7.3.2.5 Stormwater Operation and Maintenance Costs

The stormwater fund operation and maintenance costs include personnel, maintenance, utilities, and transfers. The 2016 personnel cost budget was increased 3% annually.

Maintenance and utilities costs were assumed to increase 3% annually above the 2016 budgeted amount due to general inflation. Additional maintenance and utilities costs were assumed equal to 0.25% of the stormwater capital improvement spending. Indirect costs were assumed equal to the 2016 budgeted amount for the duration of the scenario periods.

7.3.2.6 Sewer and Stormwater Debt Service

Existing sewer, stormwater, and general obligation (GO) debt service was provided by the UG Finance Department. Additional debt issued through the end of each scenario-planning period was based on the amount needed to fund capital projects after all available cash revenue has been applied. New debt is assumed to be GO-backed debt with a 20-year term and a 4.0% average interest rate. Debt issued after 2016 is assumed to experience an increase in the average interest rate of 0.25% per year, with average interest rates capped at 5.50% after 6 years.

7.3.2.7 Sewer and Stormwater CMIP

The sewer and stormwater capital maintenance improvement plan used in the financial model was based on the scenario used for each model run. The needs represented in the CMIP and financial model are to meet all operation, maintenance, and capital requirements of the wastewater and stormwater utilities as indicated in the scenario definitions in Sections 5.0 and 6.0. Project costs (2015) were inflated three percent annually to account for inflation in the financial model.

7.3.2.8 Cashflow and Debt Constraints

Operating reserves are targeted at minimum of 10% of total revenue requirements based on existing policy. Debt service coverage ratio, total debt as a percentage of revenue, and total debt per customer are calculated in the model; however, these metrics are not used as constraints.

7.3.2.9 Median Household Income

Based on the American Community Survey (ACS) for 2014, MHI for Kansas City, Kansas, was $35,724. This value was maintained through 2020 and then inflated 1.0% per year in the financial model.

7.3.2.10 Model Scenarios

Five scenarios were modeled in accordance with various levels of CSO control as defined in Section 5.0. The variation in program costs for Alternatives A1 through A4 is related to different levels of CSO control for each. It was assumed that the implementation schedule to achieve these levels of CSO control would be limited to 25 years. The fifth scenario, Alternative C, is a 10-year plan. Work to be done in the first 10 years of each plan is the same for all five options, which are summarized in Table 7-5. The Alternative B scenario presented in Section 5.0 was not modeled as a financial model scenario.

Table 7-5: Financial Model Scenarios

Parameter	Scenario Alternative A1	Scenario Alternative A2	Scenario Alternative A3	Scenario Alternative A4	Scenario Alternative C
Program Length	25 years (2016 to 2040)	25 years (2016 to 2040)	25 years (2016 to 2040)	25 years (2016 to 2040)	10 years (2016 to 2025)
Level of Control (CSO)	≤12 Overflow Events per Design Year	≤7 Overflow Events per Design Year	≤3 Overflow Events per Design Year	0 Overflow Events per Design Year	-
Level of Service (SSO)	Two-Year Storm Event	Two-Year Storm Event	Two-Year Storm Event	Two-Year Storm Event	-
Infrastructure Renewal	$304,249,000	$304,249,000	$304,249,000	$304,249,000	$133,565,000
Infrastructure Upgrades	$20,632,000	$20,632,000	$20,632,000	$20,632,000	$17,132,000
SSO Control	$87,909,700	$87,909,700	$87,909,700	$86,109,700	$47,376,000
CSO Control	$198,957,000	$298,344,000	$466,664,000	$977,244,000	$12,051,000
Implementation and Compliance	$58,956,000	$66,906,000	$80,373,000	$121,076,000	$16,916,000
Anticipated Regulatory Requirements	$123,400,000	$123,400,000	$123,400,000	$123,400,000	$1,500,000
Total Program Cost	$794,103,700	$901,440,700	$1,083,227,700	$1,632,710,700	$228,540,000

Note: Estimated costs are presented in 2015 dollars.

7.3.3 Results and Discussion

Financial plans for each scenario are included in Appendix D and the results are described in detail below. Each of the scenarios increases rates in the first ten years not to exceed an approximate 1.75% of MHI. The annual minimum debt service coverage in all scenarios is 1.5 on a combined utility basis.

7.3.3.1 Alternative A1
In Alternative A1, the combined monthly bill increases from $41.23 in 2016 to $163.79 in 2040. The cumulative increase over the forecast period is approximately 300%. In 2040 (Year 25), the annual combined bill climbs to 4.51% of the projected MHI.

7.3.3.2 Alternative A2
In Alternative A2, the combined monthly bill increases from $41.23 in 2016 to $170.05 in 2040. The cumulative increase over the forecast period is approximately 316%. In 2040 (Year 25), the annual combined bill climbs to 4.68% of the projected MHI.

7.3.3.3 Alternative A3
In Alternative A3, the combined monthly bill increases from $41.23 in 2016 to $186.61 in 2040. The cumulative increase over the forecast period is approximately 358%. In 2040 (Year 25), the annual combined bill climbs to 5.14% of the projected MHI.

7.3.3.4 Alternative A4
In Alternative A4, the combined monthly bill increases from $41.23 in 2016 to $258.96 in 2040. The cumulative increase over the forecast period is approximately 535%. In 2040 (Year 25), the annual combined bill climbs to 7.13% of the projected MHI.

7.3.3.5 Alternative C
Alternative C is a look at the first ten years of all four scenarios. The cumulative increase over the first ten years is approximately 44%, increasing the combined monthly bill to $59.43. In 2026 (Year 10), the annual combined bill climbs to 1.90% of projected MHI.

7.4 Financial Capability Assessment

7.4.1 Introduction
The UG has completed an FCA in accordance with the *Combined Sewer Overflows – Guidance for Financial Capability Assessment and Schedule Development* published in 1997. The process to complete an FCA is documented in the EPA's 1997 guidance and includes the development of ten worksheets. The Residential Indicator (RI) is developed in the first two worksheets, while the next seven worksheets develop the Financial Capability Indicator (FCI). The final worksheet includes the matrix used to estimate the financial burden represented by the RI and FCI development.

7.4.2 Residential Indicator

7.4.2.1 Methodology
Worksheet 1 represents the first step in the development of the RI. The primary goal of Worksheet 1 is to determine the cost per household (CPH) of the current and proposed wastewater treatment (WWT) and CSO projects (including other collection system projects). The CPH takes into consideration both current and proposed costs of overflow control on a residential user. Worksheet 2 represents the second step in the development of the RI. This step involves a comparison of CPH identified in Worksheet 1 to the community's MHI. As indicated in Table 7-6, per the EPA's guidance, costs per household that exceed 2.0% MHI are considered to have a high financial impact.

Table 7-6: EPA FCA Residential Indicator Criteria

Financial Impact	Residential Indicator (CPH as % of MHI)
Low	Less than 1.0% of MHI
Mid-Range	1.0% to 2.0% of MHI
High	Greater than 2.0% MHI

7.4.2.1.1 Worksheet 1 – Cost per Household

The CPH for residential customers includes operating and debt service costs related to wastewater and stormwater service. As documented in the EPA's 1997 guidance, Lines 100 and 101 in Table 7-7 represent the existing operating and capital (debt service) costs for the UG, based on the 2016 budget. Projected operating and debt service costs are shown on Lines 103 and 104 for various scenarios previously defined. Existing and projected operating costs are summarized on Line 106. A portion of these costs is assigned to residential customers in accordance with their use of the system, and is subsequently divided by the households to derive the annual CPH shown on Line 109 of Table 7-7.

Table 7-7: Wastewater and Stormwater Cost per Household (Worksheet 1)

Line No.	Description	Value (Alternative A1)	Value (Alternative A2)	Value (Alternative A3)	Value (Alternative A4)	Value (Alternative C)
Current WWT and Stormwater Costs						
100	Annual O&M Expense (2016)[1]					
	Wastewater Utility	$20,669,100	$20,669,100	$20,669,100	$20,669,100	$20,669,100
	Stormwater Utility	$1,142,700	$1,142,700	$1,142,700	$1,142,700	$1,142,700
	Annual Cash Financed Capital Projects (2016)[2]					
	Wastewater Utility	$7,863,300	$7,777,200	$9,281,400	$14,050,300	$5,518,000
	Stormwater Utility	$735,900	$735,900	$735,900	$735,900	$776,100
101	Annual Debt Service (2016)[1]					
	Wastewater Utility	$6,987,300	$6,987,300	$6,987,300	$6,987,300	$6,987,300
	Stormwater Utility	$1,103,100	$1,103,100	$1,103,100	$1,103,100	$1,103,100
102	Subtotal (Line 100 + Line 101)	$38,501,400	$38,415,300	$39,919,500	$44,688,400	$36,196,300
Projected Stormwater WWT and CSO Costs						
103	Estimated Additional O&M Expense[3]	$1,447,800	$1,721,500	$2,082,000	$3,157,600	$414,000

Line No.	Description	Value (Alternative A1)	Value (Alternative A2)	Value (Alternative A3)	Value (Alternative A4)	Value (Alternative C)
104	Annual Debt Service on Projected Capital Projects[4]	$42,612,800	$50,669,400	$61,278,500	$92,937,800	$12,185,000
105	Subtotal (Line 103 + Line 104)	$44,060,600	$52,390,900	$63,360,500	$96,095,400	$12,599,000
106	Total Current and Projected WWT and CSO Costs (Line 102 + Line 105)	$82,562,000	$90,806,200	$103,280,000	$140,783,800	$48,795,300
107	Residential Share of Total WWT and CSO Costs (54.9%)	$45,354,300	$49,883,100	$56,735,400	$77,337,600	$26,805,000
108	Total Number of Residential Households	43,008	43,008	43,008	43,008	43,008
109	Annual Cost per Household (Line 107 / Line 108)	$1,055	$1,160	$1,319	$1,798	$623

Source:
1. UG 2016 Budget.
2. Calculated average from each financial forecast.
3. 0.25% of total projected capital costs.
4. Total debt projected to be financed at 4.0% for 20 years.

7.4.2.1.2 Worksheet 2 – Residential Indicator

According to the 2014 ACS, the MHI for Kansas City, Kansas, was $35,724. This value was escalated from 2014 to 2016 dollars using a consumer price index (CPI) of 1.0%. The resulting 2016 adjusted MHI is shown on Line 203 of Table 7-8. The annual CPH estimated in Worksheet 1 for each scenario is then divided by MHI to determine the RI.

Table 7-8: Residential Indicator (Worksheet 2)

Line No.	Description	Value (Alternative A1)	Value (Alternative A2)	Value (Alternative A3)	Value (Alternative A4)	Value (Alternative C)
Median Household Income						
201	Census Year MHI (2014)[1]	$35,724	$35,724	$35,724	$35,724	$35,724
202	MHI Adjustment Factor (Two-Year Average CPI)[2]	1.0201	1.0201	1.0201	1.0201	1.0201
203	Adjusted MHI (Line 201 by Line 202)	$36,442	$36,442	$36,442	$36,442	$36,442
204	Annual WWT and CSO CPH (Worksheet 1, Line 109)	$1,055	$1,160	$1,319	$1,798	$623
205	Residential Indicator (Line 204/Line 203 by 100)	2.9%	3.2%	3.6%	4.9%	1.7%

Source:

1. U.S. Census Bureau, 2014 ACS Survey, Kansas City, KS.
2. Consumer Price Index, Midwest Urban, not seasonally adjusted. Adjustment factor calculation = (1+1.0%)^2.

7.4.2.2 Results and Discussion

An RI is considered high financial impact if it exceeds 2.0%, while mid-range is defined by the EPA as 1.0% to 2.0%. Worksheet 2 (Table 7-8) shows on Line 205 that all 25-year scenarios result in a very high financial impact. Option C, the 10-year scenario, represents an upper half mid-range financial impact. It is highly likely that additional controls beyond the 10-year scenario will result in high ratepayer burdens.

7.4.3 Financial Capability Indicator

7.4.3.1 Methodology

In the second phase of the FCA evaluation, selected indicators are assessed to evaluate the financial capability of the community. The EPA's 1997 guidance identifies three types of financial capability indicators, described below. The information necessary to determine a community's FCI may be sourced from audited financial statements, the Bureau of Labor Statistics, and debt rating agencies, among others.

Debt Indicators – Assess the current debt burden of the community and their ability to issue additional debt to finance the CSO controls. The indicators used to measure this are:

- Bond Ratings (Worksheet 3).
- Overall Net Debt as a Percent of Full Market Property Value (Worksheet 4).

Socioeconomic Indicators – Assess the general well-being of residential users in the community. The indicators selected for this purpose are:

- Unemployment Rate (Worksheet 5).
- Median Household Income (Worksheet 6).

Financial Management Indicators – Evaluate the community's overall ability to manage financial operations. The indicators selected for this purpose are:

- Property Tax Revenue Collection Rate (Worksheet 7).
- Property Tax Revenue as a Percentage of Full Market Property Value (Worksheet 8).

Each one of these indicators are evaluated in Worksheets 3 through 9, described in the following sub-sections.

7.4.3.2 Worksheet 3 – Bond Rating

The debt indicator in Worksheet 3 is the GO bond rating of the UG. The UG's most recent Standard & Poor's (S&P) credit rating is AA as shown in Table 7-9.

Table 7-9: Bond Rating (Worksheet 3)

Line No.	Description	Value
301	Most Recent General Obligation Bond Rating[1]	AA
302	Most Recent Revenue Bond Raing[2]	--
303	Summary Bond Rating	AA

Notes:
1. Standard & Poor's Rating, communicated by the UG.
2. There are no current Revenue Bonds.

S&P rates bonds on a scale of AAA to D, with AAA being the strongest rating assigned by S&P, and D being the weakest. According to the EPA's 1997 guidance, S&P's bond rating scale is interpreted within an FCA as weak, mid-range, or strong as follows:

- Weak – BB, B, CCC, CC, C, D.
- Mid-Range – BBB.
- Strong – AAA, AA, A.

With a bond rating of AA, as shown on Line 303 of Worksheet 3, the UG's summary bond rating is strong. However, this rating criterion is highly suspect because utilities self-select in terms of bond rating. Only utilities which expect strong bond ratings pay for such ratings. Thus, this factor should be eliminated from the evaluation.

7.4.3.3 Worksheet 4 – Overall Net Debt as a Percent of Full Market Property Value

Worksheet 4 evaluates a community's debt in comparison to the full market property value. Overall net debt is debt repaid by property taxes in the permittee's service area. It excludes the debt of revenue bonds issued and repaid with user fees. This indicator provides a measure of the debt burden on residents and the ability of the local government to issue additional debt. It includes the debt issued directly by the local government and the debt of overlapping entities, such as school districts. The indicator compares the level of debt owed by the service area population with the full market value of real property used to support the debt.

The UG has outstanding net debt of $288.7 million, as shown on Line 401 of Worksheet 4 (Table 7-10). For the purpose of this analysis, net debt excludes revenue bond debt recovered through enterprise user fees. Including an allowance for the UG’s share of debt from overlapping entities of $173.7 million, the UG’s overall net debt totals $462.4 million, as shown on Lines 402 and 403, respectively.

The UG’s CAFR indicates the full market value of the community’s property is approximately $6.4 billion. Dividing the overall net debt by the full market property value yields a result of 7.3%, shown on Line 405. According to the EPA’s 1997 guidance, overall net debt as a percent of full market property value is interpreted within an FCA as weak, mid-range, or strong as follows:

- Weak – Above 5%.
- Mid-Range – 2 to 5%.
- Strong – Below 2%.

With an overall net debt as a percent of full market property value of 7.3%, the UG’s result for this indicator is weak.

Table 7-10: Overall Net Debt as a Percent of Full Market Property Value (Worksheet 4)

Line No.	Description			Value
401	Direct Net Debt	GO Bonds		
		Government Activities[1]		$231,366,706
		Business Type Activities[1]		$57,308,294
		Total Outstanding Principal		$288,675,000
402	Debt of Overlapping Entities (Proportional share of multijurisdictional debt)[2]	Debt Outstanding	% Applicable	Share of Overlapping Debt
	Kansas City Kansas Community College	$37,390,000	90%	$33,521,447
	Unified School District (USD) 500	$66,160,000	100%	$66,149,409
	USD 202	$36,765,000	100%	$36,707,803
	USD 203	$29,565,000	100%	$29,565,000
	USD 204	$28,121,363	28%	$7,781,489
	City of Bonner Springs	$15,978,593	0%	$0
	City of Edwardsville	$6,620,000	0%	$0
	Total debt from overlapping entities			$173,725,148
403	Overall Net Debt (Line 401 + Line 402)			$462,400,148

Line No.	Description			Value
404	Market Value of Property[3]			$6,372,823,830
405	Overall Net Debt as % of Full Market Value of Property (Line 403/Line 404)			7.3%

Notes:
1. 2014 CAFR, p. 48.
2. Provided by the UG.
3. 2014 CAFR, p. 143.

7.4.3.4 Worksheet 5 – Unemployment Rate

According to the Kansas Department of Labor, the UG's annual unemployment rate was 4.9% in 2015 as shown in Table 7-11. Comparing the UG's unemployment rate to the national unemployment rate of 5.3% yields a difference of 0.4 percentage points. According to the EPA's 1997 guidance, the unemployment rate indicator is interpreted within an FCA as weak, mid-range, or strong as follows:

- Weak – More than 1% above the national average.
- Mid-Range – Plus or minus 1% of the national average.
- Strong – More than 1% below the national average.

With a variance of 0.4% for KCK, the unemployment indicator is mid-range.

Table 7-11: Unemployment Rate (Worksheet 5)

Line No.	Description	Value
501	Unemployment Rate - Permittee[1]	4.9%
502	Unemployment Rate - County (use if permittee rate is not available)	6.2%
503	Average National Unemployment Rate[1]	5.3%

Notes:
1. Labor Market Information Services, Kansas Department of Labor in cooperation with the Bureau of Labor Statistics, Local Area Unemployment Statistics, 2015.

7.4.3.5 Worksheet 6 – Median Household Income

The MHI is defined as the median amount of total income dollars received per household during a calendar year. This indicator provides context regarding a community's earning capacity and is evaluated by comparing the community's MHI to the national MHI. Worksheet 6 (Table 7-12) documents the development of this indicator. The community's MHI was previously identified as $36,442 on Line 203 of Worksheet 2 (Table 7-8). The 2014 national MHI was obtained from the 2014 ACS and adjusted to 2016 dollars in a manner consistent with the community's MHI.

Table 7-12: Median Household Income (Worksheet 6)

Line No.	Description	Value
601	Median Household Income (2016)[1]	$36,442
602	Census Year National MHI (2014)[2]	$53,657
603	MHI Adjustment Factor	1.0201
604	Adjusted National MHI (2016)	$54,736

Notes:
1. Worksheet 2 (Table 7-8), Line 203.
2, U.S. Census Bureau, United States, 2014 ACS.

According to the EPA's 1997 guidance, the median household indicator is interpreted within an FCA as weak, mid-range, or strong as follows:

- Weak – More than 25% below Adjusted National MHI.
- Mid-Range – Plus or minus 25% of the Adjusted National MHI.
- Strong – More than 25% above the Adjusted National MHI.

The difference between the adjusted national MHI shown on 604 and the community's adjusted MHI shown on Line 601 is $18,294, or approximately 33.4% of the adjusted national MHI. With a result more than 25% below the adjusted national MHI, the MHI indicator is weak.

7.4.3.6 Worksheet 7 – Property Tax Revenues as a Percent of Full Market Property Value

The EPA considers the relationship of property tax revenues to full market property value as a measure of "property tax burden" since it indicates the funding capacity available to support debt based on the wealth of the community. The community's full market property value was previously identified as approximately $6.4 billion on Line 404 of Worksheet 4 (Table 7-10). According to the UG's CAFR, $86.8 million in property tax revenues were collected in 2014. Dividing property tax revenues by the full market value of real property provides a ratio of 1.36% as shown in Table 7-13.

Table 7-13: Property Tax Revenues as a Percent of Full Market Value (Worksheet 7)

Line No.	Description	Value
701	Full Market Value of Real Property[1]	$6,372,823,830
702	Property Tax Revenues[2]	$86,821,225
703	Property Tax Revenues as a Percent of Full Market Property Value (Line 702/Line 701)	1.36%

Notes:
1. Worksheet 4 (Table 7-10), Line 404.
2. 2014 CAFR, p. 146.

According to the EPA's 1997 guidance, the property tax revenues as a percent of full market value indicator is interpreted within an FCA as weak, mid-range, or strong as follows:

- Weak – Above 4%.
- Mid-Range – 2 to 4%.
- Strong – Below 2%.

With a result of 1.36%, the property tax revenues as a percent of full market property value is strong.

7.4.3.7 Worksheet 8 – Property Tax Revenues Collection Rate

The property tax revenue collection rate is an indicator of the efficiency of the tax collection system and the acceptability of tax levels to residents. The property tax collection rate is determined by dividing property tax collected by property tax levied. The property tax revenues collected was previously identified as approximately $86.8 million on Line 702 of Worksheet 7 (Table 7-13). According to the UG's 2014 CAFR, property taxes levied amounted to approximately $87.0 million, shown on Line 802 of Worksheet 8 (Table 7-14).

Table 7-14: Property Tax Revenue Collection Rate (Worksheet 8)

Line No.	Description	Value
801	Property Tax Revenue Collected[1]	$86,821,225
802	Property Taxes Levied[2]	$86,991,190
803	Property Tax Revenues Collection Rate (actual) (Line 801/Line 802)	99.80%

Notes:
1. Worksheet 7 (Table 7-13), Line 702.
2. 2014 CAFR, p. 146.

According to the EPA's 1997 guidance, the property tax revenues collection rate indicator is interpreted within an FCA as weak, mid-range, or strong as follows:

- Weak – Below 94%.
- Mid-Range – 94 to 98%.
- Strong – Above 98%.

With a result of 99.8%, the UG's property collection rate is strong.

7.4.3.8 Worksheet 9 – Summary of Permittee Financial Capability Indicators

Collectively, the results documented for each indicator in Worksheets 3 through 8 are used to determine the overall FCI for the UG. Each indicator's results are assigned a numerical value based on the outcome rating of weak, mid-range, or strong. According to the EPA's 1997 guidance, the numerical values are assigned as follows:

- Weak – 1
- Mid-Range – 2
- Strong – 3

Worksheet 9 tabulates an arithmetic average based on the numeric value of each of the six indicators. Shown on Table 7-15, Line 907 shows this average to be 2.2, representing a mid-range result for the FCI.

Table 7-15: Summary of Financial Capability Indicators (Worksheet 9)

Line No.	Description	Value	Benchmark	Score
901	Bond Rating (Line 303)	AA	Strong	3
902	Overall Net Debt as Percent of Full Market Property Value (Line 405)	7.3%	Weak	1
903	Unemployment Rate (Local rate minus National rate) (Line 501 - Line 503)	-0.4%	Mid-Range	2
904	Median Household Income (vs. National MHI) (Line 601 / Line 604)	-33.4%	Weak	1
905	Property Tax Revenues as a Percent of Full Market Property Value (Line 703)	1.4%	Strong	3
906	Property Tax Revenue Collection Rate (Line 803)	99.8%	Strong	3
907	Permittee Indicator Score (Average of Scores)			2.2

7.4.3.9 Worksheet 10 – Financial Capability Matrix Score

An FCA determines the degree of burden through the development of the Residential Indicator and Financial Capability Indicator. Results for each indicator are evaluated through a matrix designed by the EPA to estimate the burden created by implementing a proposed overflow control plan. Worksheet 10 (Table 7-16) presents the Financial Capability Matrix, with the FCI represented in the rows of the matrix and the RI represented in the columns. As shown previously in Worksheet 2 (Table 7-8), the RI ranges from 1.7% to 4.9%, with all 25-year scenarios exceeding 2.0%. This result indicates the UG is in the mid-range for Alternative C and high for all other alternatives evaluated. The FCI was determined to be 2.2 on Worksheet 9 (Table 7-15), which is a mid-range result on the FCI scale. Overall, these results indicate the financial burden of the CSO program Alternative C to be a mid-range, while all other alternatives are indicated to be a high burden as summarized in Table 7-16.

Table 7-16: Financial Capability Matrix (Worksheet 10)

Financial Capability Indicator Score	Residential Indicator		
	Low (Below 1%)	Mid-Range (1-2%)	High (Above 2%)
Weak (Below 1.5)	Medium Burden	High Burden	High Burden
Mid-Range (1.5-2.5)	Low Burden	Medium Burden (Alternative C)	High Burden (Alternatives A1, A2, A3, and A4)
Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden

7.5 Conclusions

The financial impact of CSO control programs can create difficult challenges for communities such as KCK. As shown on Figure 7-8, currently there are already some areas within the CSS in which the typical annual combined wastewater and stormwater bill exceeds 2.0% of the (census tract) MHI.

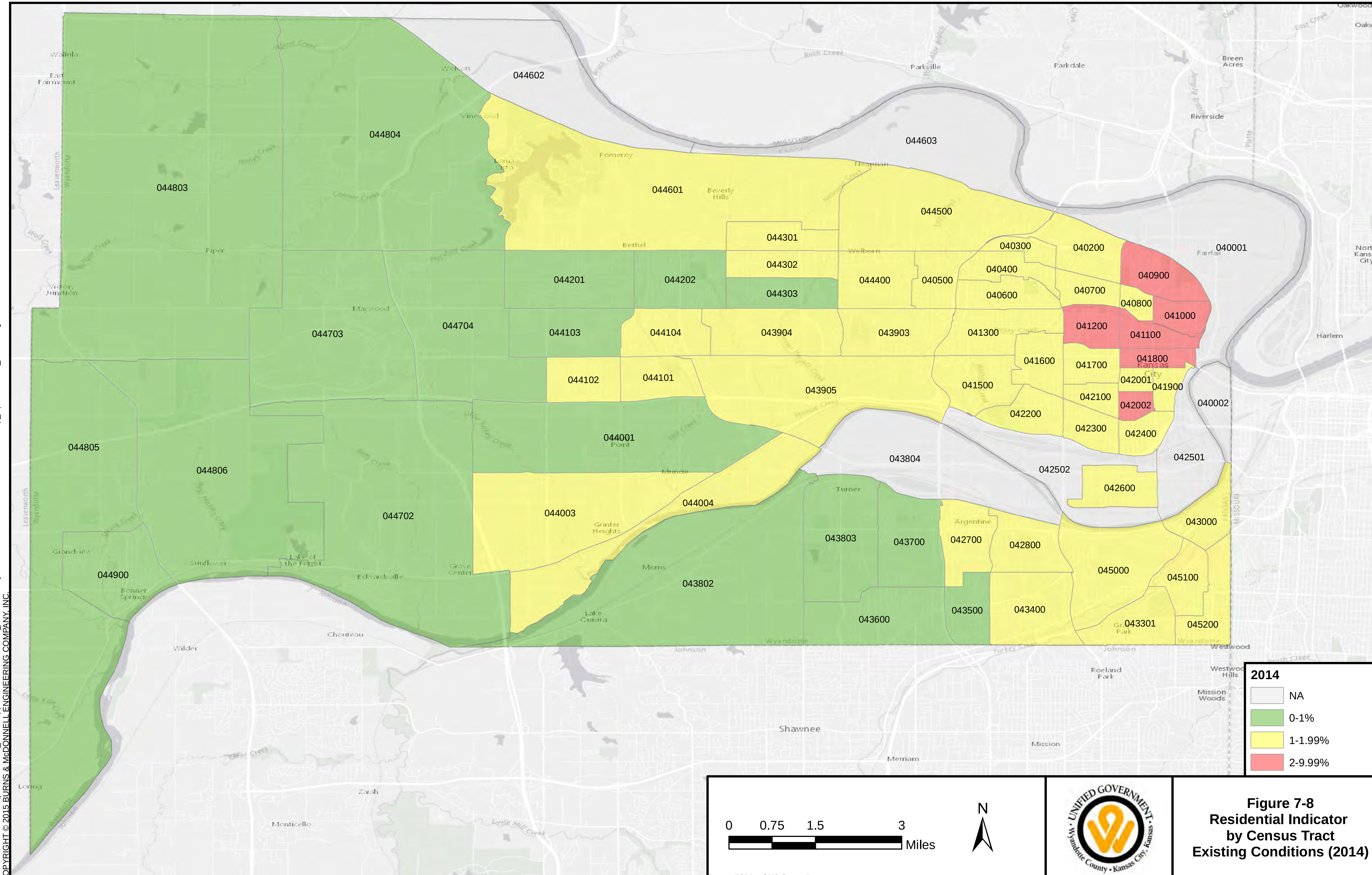


Figure 7-8
Residential Indicator
by Census Tract
Existing Conditions (2014)

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Achieving the levels of overflow control identified in the characterization effort within a 25-year timeframe would present a significantly high burden for the community. The four 25-year overflow control scenarios result in a very high burden RI (between 2.9% and 4.9%) for the community as a whole, i.e., these scenarios are unaffordable under the EPA guidance. Looking at this in a slightly different way, by projecting the MHI by census tract out over a 25-year period, the hypothetical impact of the necessary rate increases can be seen. As shown on Figure 7-9 through Figure 7-12, the entire community exceeds the EPA-defined maximum level of affordability as the level of control increases.

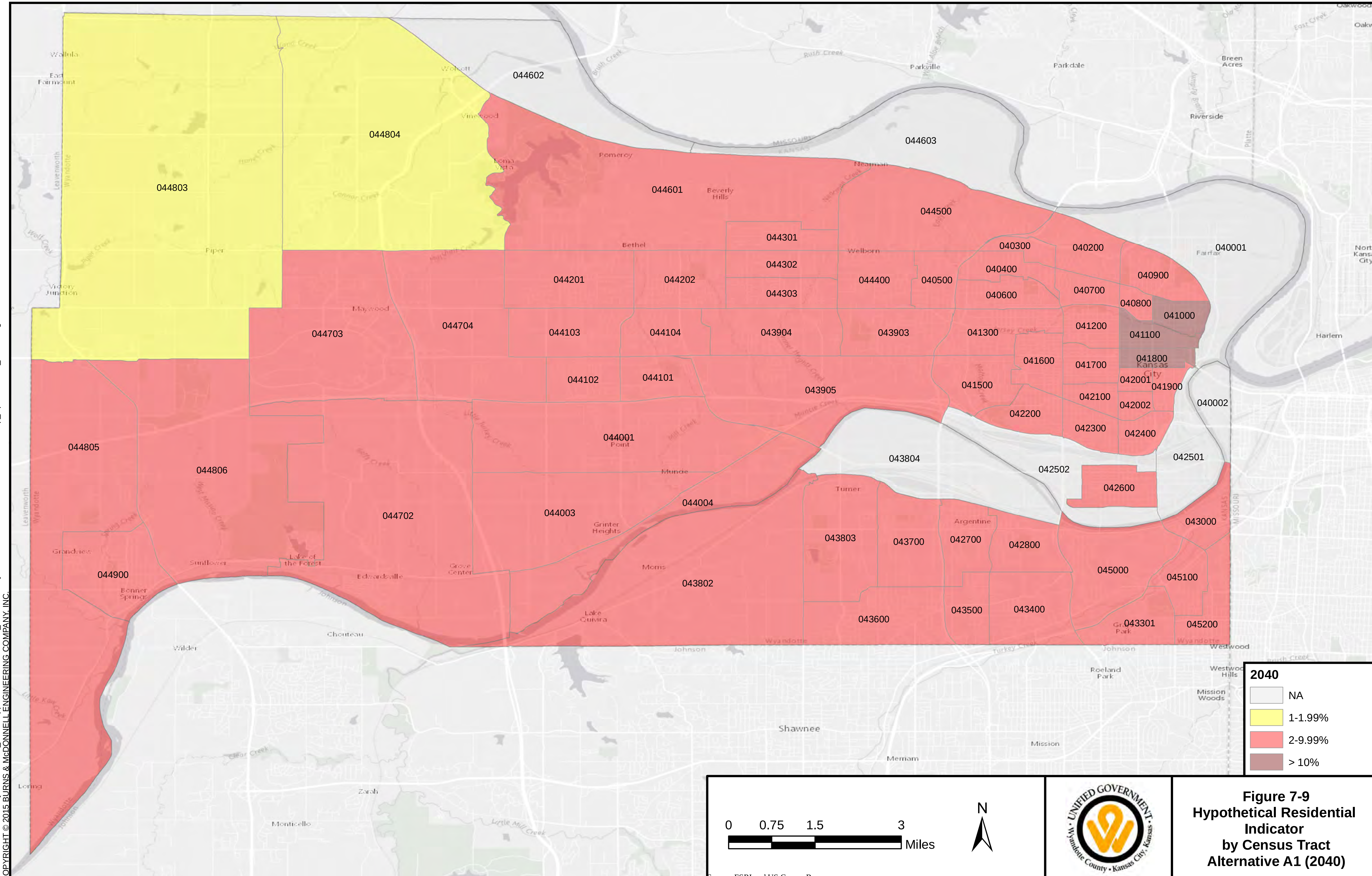

Figure 7-9
Hypothetical Residential Indicator
by Census Tract
Alternative A1 (2040)

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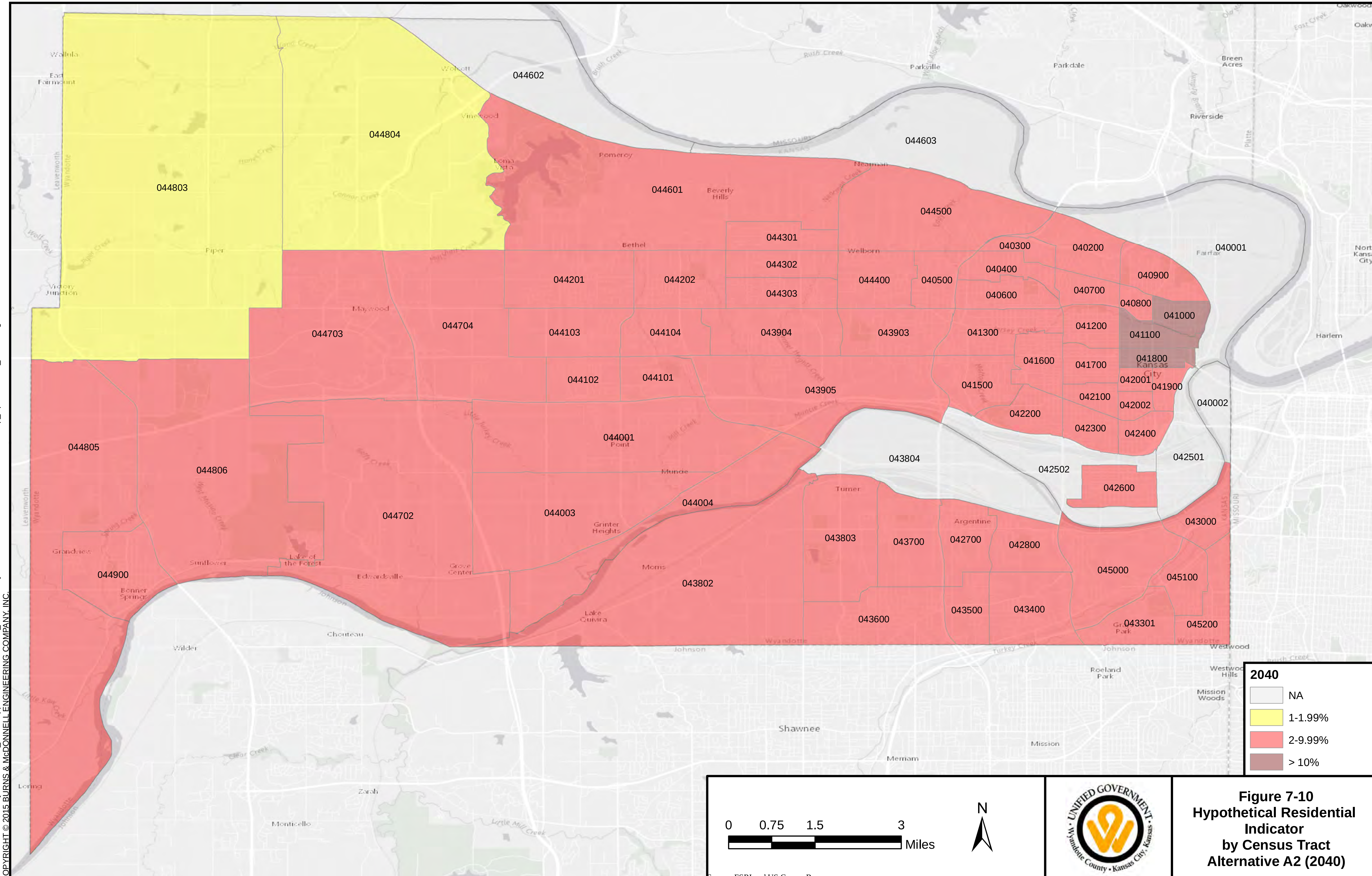

Figure 7-10
Hypothetical Residential Indicator by Census Tract Alternative A2 (2040)

Source: ESRI and US Census Bureau

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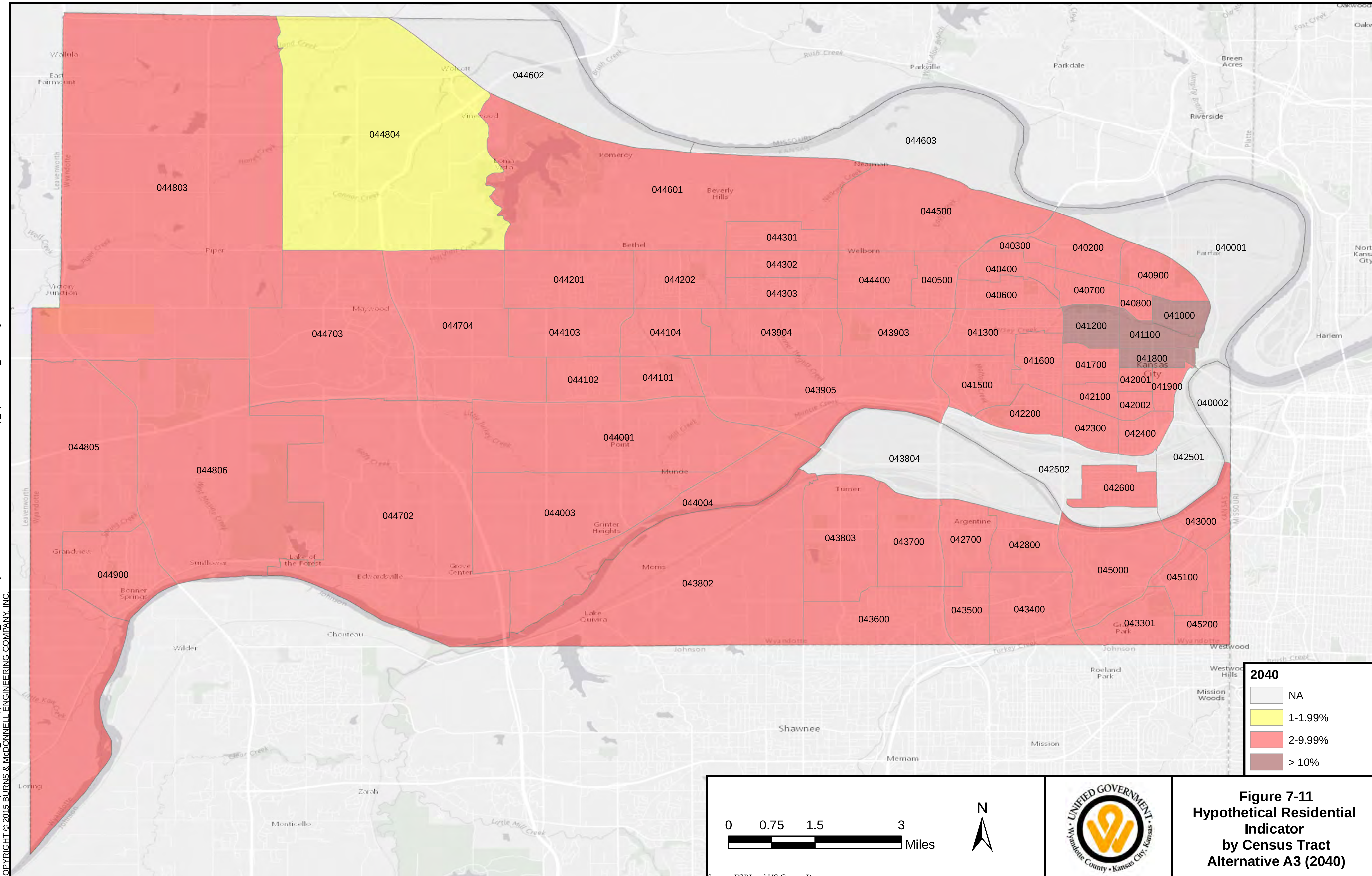

Figure 7-11
Hypothetical Residential Indicator by Census Tract Alternative A3 (2040)

Source: ESRI and US Census Bureau

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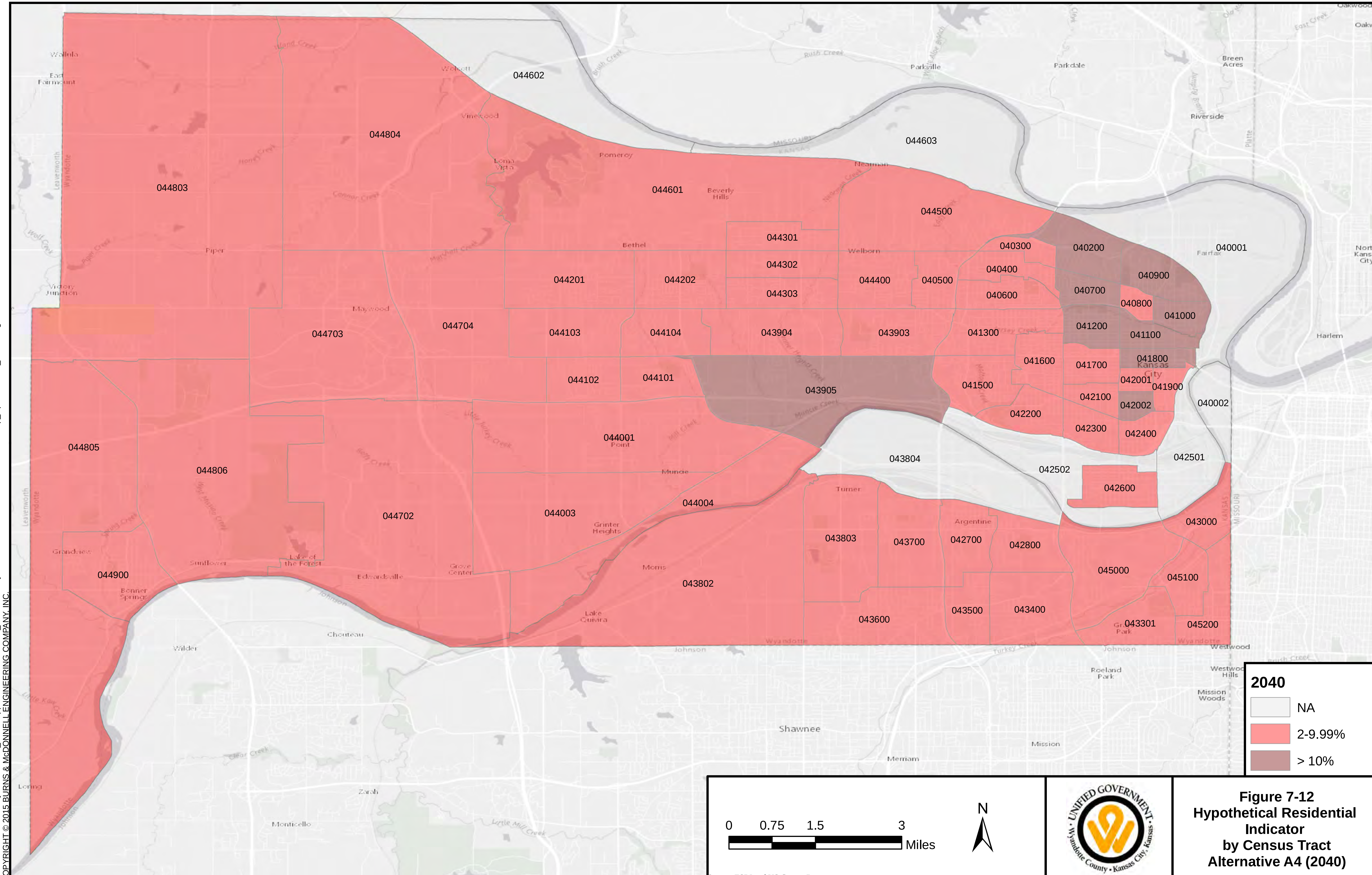

Figure 7-12
Hypothetical Residential Indicator by Census Tract Alternative A4 (2040)

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Funding capital projects even at the lower end of CSO control scenarios considered will create a high burden for many in the UG service area. Thus, as encouraged by the EPA, supplemental socioeconomic indicators were presented to further demonstrate the poor financial capability of the UG's customers. It was determined that even an RI around 1.7% will cause a high burden for most of the community and have a disproportionate burden on lower and fixed income households in the community.

Due to the UG's limited financial capability and understanding that the ability to meet CWA objectives rests on the financial capability of individual households, the UG reviewed a fifth, shorter-term alternative that makes progress towards meeting the levels of overflow control identified in the characterization effort. At an RI of 1.7%, this alternative still represents a high burden commitment as shown on Figure 7-13 where the MHI is projected by census tract over a 10-year period.

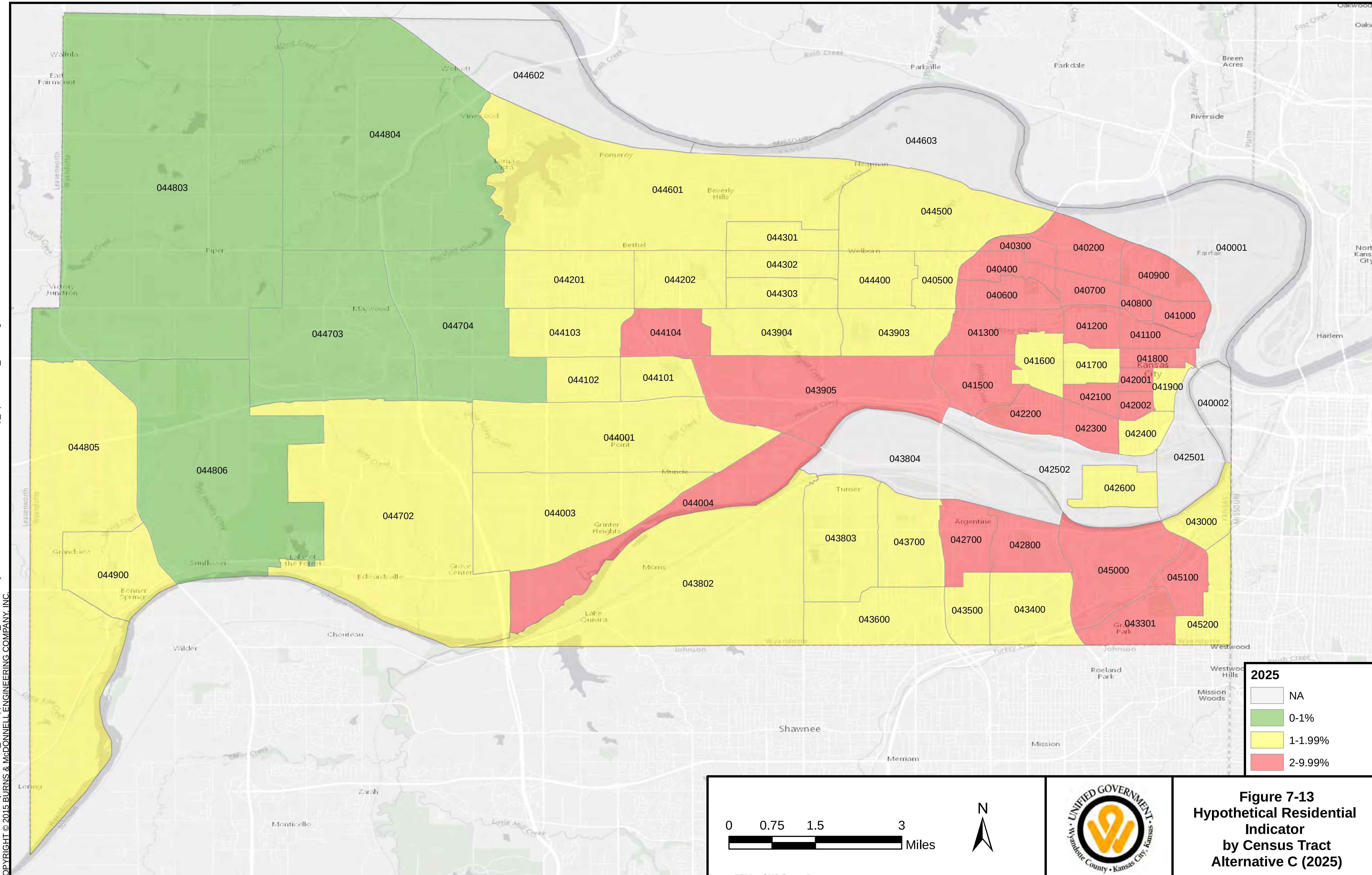

Figure 7-13
Hypothetical Residential Indicator by Census Tract Alternative C (2025)

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It is important to further consider the impact that substantial additional wastewater and stormwater utility costs will have on the service area population. Based on the projected community-wide MHI, the typical monthly bill is anticipated to be 1.9% of the MHI in Year 10. However, for the lowest quintile population, the typical monthly bill is anticipated to be over 9.0% of the MHI in Year 10 and could easily slip into a higher burden if the assumptions herein change. In other words, for this segment of the service area population, the annual combined bill would exceed $700 while their annual household income is less than $8,000. This burden on the UG customers and level of debt required to meet the levels of overflow control identified in the characterization effort are unacceptable and unsustainable.

8.0 PUBLIC PARTICIPATION

8.1 Introduction

In addition to being a requirement in the PCD and *CSO Control Policy*, the UG recognized the importance of a public participation plan to educate and solicit comments from the public, including a community task force, regarding the IOCP. Initially outlined in the *SSE Work Plan*, this section details the public participation efforts completed to date. Desired outcomes of the public participation effort included:

- Customers understand how their wastewater system functions and understand what CSOs and SSOs are.
- Customers understand that while the UG has always worked to maintain the system, the system is in need of a great deal of repair and renewal as it continues to age.
- Customers understand that reinvestment in the aging wastewater system is necessary.
- Customers understand that a plan to strictly meet the requirements of the CWA and *CSO Control Policy* will require many years and several hundred million dollars.
- The UG will work to protect the customers' best interests and desires in regards to affordability.

8.2 Public Education

8.2.1 CSO Warning Signs

As identified in the NMC Plan, signs are located at all CSO outfalls to alert the public that the location has the potential to discharge combined sewage and to request notification if discharges are observed.

8.2.2 Education Video

A public educational video was created and presented at all of the public neighborhood presentations referred to as "road show presentations." The video has been presented to and approved by UG leadership including the County Administrator, Mayor, and Commissioners. The video is available on the Public Works Department website and the IOCP website at http://www.ugiocp.com. This 4-minute video describes the separate and combined sewer systems, explains that CSOs occur during larger wet weather events, and discusses the importance of the impacted waterways to the region. The importance of improving the wastewater system to comply with EPA regulations, serve public needs, and protect water quality for all citizens is stressed. Finally, the video emphasizes the immediate and long-term benefits and importance of reinvesting in sewer infrastructure.

8.2.3 Employee Education

Presentations, similar to the road show presentations, were given to WPCD and Engineering Division staff several times throughout development of the IOCP. This reinforced the importance of the work that they do. Educating other employees about the sewer system, sewer overflows, the implications of the CWA, and the IOCP is an integral part of the public participation plan. Employees of the UG are required to reside in Wyandotte County. Not all, but many are wastewater customers and they are in frequent contact with the public and can be a helpful informational resource to the program. The WPCD and Engineering Divisions staff have provided valuable detailed information and input into the IOCP.

8.2.4 Public Education Materials

Brochures, both tri-fold and two-page, were developed to educate the public about their sewer system, sewer overflows, CWA regulations, and the IOCP. These materials were distributed at road show presentations and other public events. They, along with stormwater education materials, are available to the public at several locations, such as at City Hall. A copy of these brochures is provided in Appendix E.

8.2.5 Website

A website was created for the IOCP that provides copies of the brochure, access to the educational video, contact information, a comment section, and the community survey. Viewable at http://www.ugiocp.com, the cover page is provided in Appendix F.

There is also information at the Public Works Department (http://www.wycokck.org/pw/) and WPCD (http://www.wycokck.org/wpc/) websites. There is a link to the http://www.ugiocp.com site from these sites.

8.2.6 WWTP Tours

WWTP tours are made available to the public for free with an appointment. Community task force members were taken on a tour of the Kaw Point WWTP on June 23, 2016. The tour provides an understanding of the operational mechanics and why the WWTP is limited to the amount of combined stormwater and wastewater flow it can effectively treat. This helps to reinforce the understanding of the occurrence of CSOs during wet weather periods.

8.2.7 Stormwater Management Outreach

In accordance with the MS4 Permit, numerous public outreach efforts are conducted throughout the year to increase public knowledge and awareness of steps that can be taken to reduce pollutants into the storm sewer system. These efforts are documented in the MS4 Annual Report each year.

8.3 Community Task Force

A task force consisting of five members representing various stakeholder interests and geographic parts of the community was convened in 2015. The task force members were invited by the Mayor and Commissioners and included: the Kansas River Keeper of the Friends of the Kaw, a former UG Public Works Department employee, a community mobilizer involved in the Latino Health Initiative, the President of the KCK National Association for the Advancement of Colored People (NAACP) and a Kansas Sierra Club board member, and a nutrition and wellness community education expert.

The task force members were charged with providing input that reflects what the community and stakeholders value and participated in five meetings during 2015 and 2016. The task force members were asked to consider and help solicit community input to answer many questions, including the following:

- What are the environmental priorities of the community?
- Should the UG have differing levels of control for different receiving waters or basins?
- Should IOCP investments address other desired community outcomes?
- What should be done regarding affordability to ratepayers?
- Should priority be placed on renewal of existing infrastructure over new overflow control facilities?

Community task force meeting presentations are provided in Appendix G. The task force provided valuable insight that was considered throughout development of the IOCP. The task force members prepared and signed a letter supporting the Recommended Plan. The letter, provided in Appendix H, states that the Recommended Plan addresses the community's highest priority of renewing the existing infrastructure and makes important progress towards meeting CWA goals.

8.4 Road Show Presentations

In 2015 and 2016, road show presentations reached over 1,500 citizens at 26 events to date as listed in Table 8-1. Commission district and neighborhood group locations are shown on Figure 8-1 for reference.

Table 8-1: Road Show Presentations

Organization	Commission District(s)	Presentation Date
Riverview Acres	7	1/22/2015
Livable Neighborhoods (representatives from all neighborhood groups and several community groups)	NA	1/22/2015
Strugglers Hill	4	2/12/2015
Wyandotte Countians Against Crime	4	2/17/2015
Kensington Community	4	2/24/2015
Turner Community Connection	6	4/20/2015
International Brotherhood of Electrical Workers (IBEW)	NA	5/14/2015
Argentine Neighborhood Development Association	3 & 6	5/19/2015
Rosedale Neighborhood Association	3	5/20/2015
Armourdale Renewal Association	2	5/21/2015
Downtown Shareholders of Kansas City, Kansas	2	5/26/2015
Historic Northeast Midtown Association	4	5/28/2015
Rotary Club of Kansas City, Kansas	2	6/2/2015
Historic Westheight	2 & 4	6/9/2015
Central Avenue Betterment Association	2	6/17/2015
Frank Rushton Neighborhood Association	3	6/18/2015
Leavenworth Road Association	5 & 8	7/14/2015
MR340 Safety Meeting	NA	7/27/2015
Parkwood Colony	1	3/15/2016
Livable Neighborhoods (representatives from all neighborhood groups and several community groups)	NA	3/24/2016
Neighbors Who Care	1	5/9/2016
Kensington	4	5/24/2016
Block Hawks	1	6/07/2016
MR340 Safety Meeting	NA	7/18/2016
District 8 Town Hall Meeting	8	8/9/2016
Rotary Club of Kansas City, Kansas	2	8/23/2016

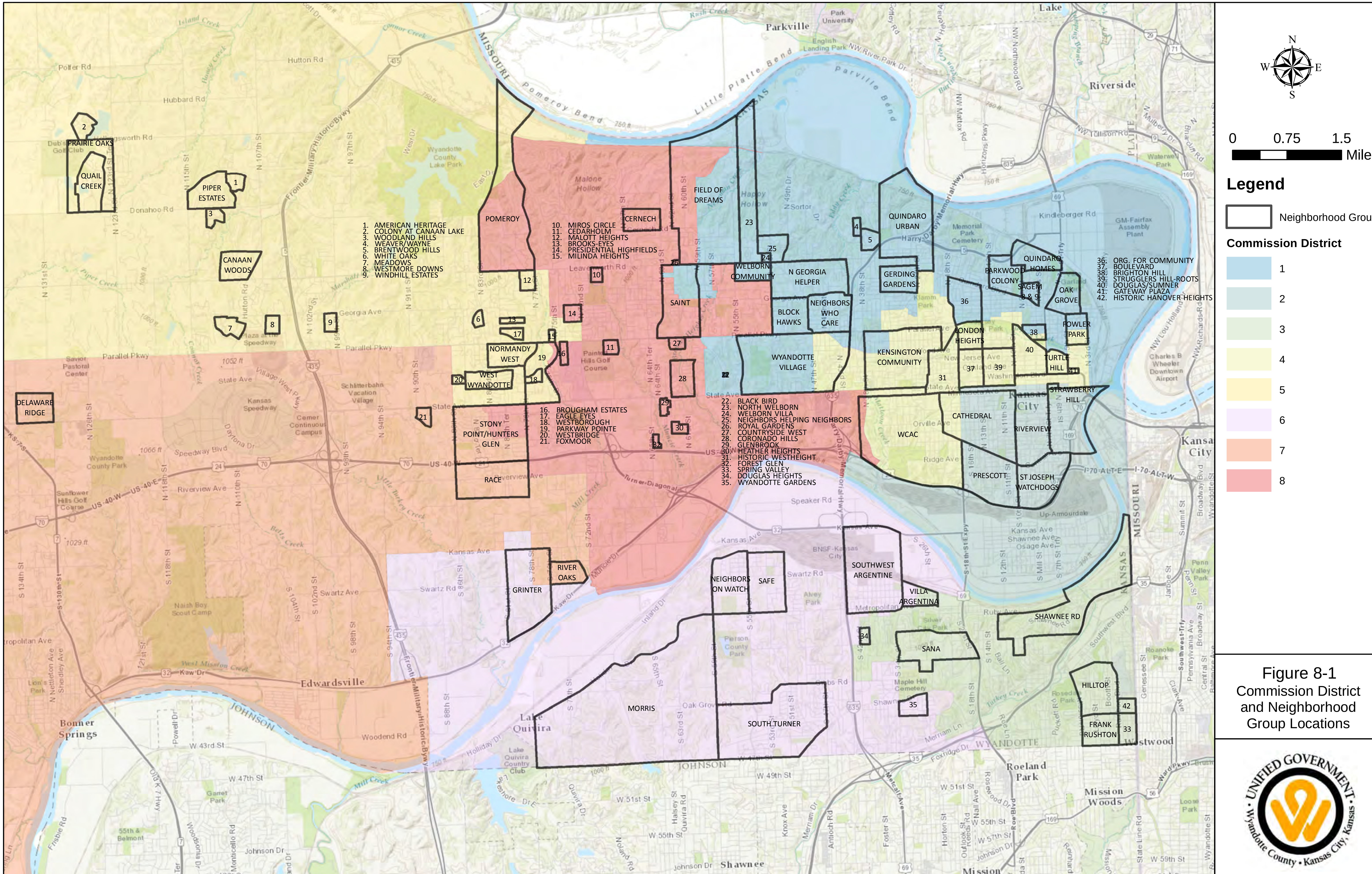


Figure 8-1
Commission District and Neighborhood Group Locations

The road show presentations provided public awareness on the following:

- CWA regulations.
- General information and statistics about the UG's wastewater system.
- Specific neighborhood group information about the sewer system.
- Sewer overflows: why they occur, their impacts on water quality, and what has been and is planned to be done to address them.
- Current investigations and studies performed (e.g., smoke testing, manhole inspections, and sewer televising).
- Current rehabilitation projects (e.g., pipeline maintenance, manhole repairs, and treatment plant upgrades).
- Financial impacts.
- Ways individuals can help, such as not flushing wipes, not putting grease in drains, and not putting litter on the street.

While citizens were engaged during the presentations, they frequently asked questions about unrelated community concerns such as local drainage issues, private sewer lateral problems, job creation, drinking water and other utility rates. The presentations and sign-in sheets from each of the road show presentations are provided in Appendix I.

8.5 Community Survey

An extensive community survey was developed in May 2016 and made available in both hard copy and a web-based form on the IOCP website. The survey was available in English and Spanish. The surveys were distributed to measure local perception of water quality and waterbody uses and how it compares to other community priorities. The results were used to inform the strategies of the IOCP. The blank survey can be found in Appendix J. Results of the 394 surveys received are discussed below.

The community faces many other challenges in addition to an aging sewer system. According to the survey results, respondents felt that maintaining the existing infrastructure, protecting drinking water quality, and protecting the safety of our citizens were the top three priorities of the community. Table 8-2 details the answers to the question regarding prioritization of community issues.

Table 8-2: Community Issue Prioritization Survey Results

<table>
<tr><th>Question</th><th>Maintaining Existing Infrastructure</th><th>Drinking Water Quality</th><th>Education</th><th>Economic Development</th><th>Water Quality</th></tr>
<tr><td rowspan="3">Our community faces many other challenges in addition to our aging sewer system. We want to know how important this issue is compared to other issues in the community.</td><td>260</td><td>182</td><td>163</td><td>110</td><td>89</td></tr>
<tr><th>Job Opportunities</th><th>Air Quality</th><th>Public Health</th><th>Transportation</th><th>Public Safety</th></tr>
<tr><td>68</td><td>57</td><td>40</td><td>31</td><td>178</td></tr>
</table>

Note: Respondents were asked to choose the three issues most important to them.

Although there are several water bodies located in Wyandotte County, citizens reportedly rarely come in contact with them. According to the survey results, approximately 80% of the participants do not swim or wade in any of the water bodies; 55% of the participants do not boat, canoe, or fish on any of the water bodies; and 33% of the participants do not participate in activities near the water bodies.

Survey respondents who use the water bodies for swimming or wading mainly swim or wade in Wyandotte County Lake and the Kansas River. According to the results, boating, canoeing, and fishing are most popular activities for the Kansas River, Missouri River, and Wyandotte County Lake. As for recreation along the water bodies, Wyandotte County Lake is the most widely used water body; however, residents also participate in recreational activities along the Kansas River, Missouri River, and around Big Eleven Lake. Table 8-3 details the answers to the question regarding community's use of local water bodies.

Table 8-3: Use of Water Bodies Survey Results

Question	Big Eleven Lake[1]	Jersey Creek	Kansas River	Mattoon Creek	Missouri River	Wyandotte County Lake[1]	None
Do you or your family members swim or wade in these water bodies?	2	0	13	0	1	70	318
Do you or your family members boat, canoe, or fish on these water bodies?	6	1	44	1	24	129	248
Do you or your family members hike, walk, bike, camp, or participate in social events along or on the banks of these water bodies?	23	6	71	2	47	190	166

Notes: Values indicate number of positive (yes) responses.

1. No CSO outfalls or constructed sanitary sewer overflows discharge directly to this water body.

When asked which water body is most important to keep clean, survey respondents indicated that Wyandotte County Lake is a priority. According to the survey results, almost a quarter of the participants identified the Kansas River as an important water body because of its wide coverage of the county. Some participants also expressed a desire to protect the Missouri River because it is the source of drinking water. Table 8-4 details the answers to the question regarding water body importance.

Table 8-4: Water Body Importance Survey Results

Question	Big Eleven Lake[1]	Jersey Creek	Kansas River	Mattoon Creek	Missouri River	Wyandotte County Lake[1]	All	None
Which water body is the single most important to you and why?	8	7	95	0	86	128	44	12

Notes:

1. No CSO outfalls or constructed sanitary sewer overflows discharge directly to this water body.

The majority of the survey responses (78%) agreed or strongly agreed that investments made to improve our wastewater system should not only consider the environment, but also the financial ability of citizens to pay for the improvements. Table 8-5 details the answers to the question regarding balancing environmental protection and affordability.

Table 8-5: Environmental Protection and Affordability Survey Results

Question	Strongly Agree	Agree	Disagree	Strongly Disagree	I Need More Information
State your level of agreement with the following statement: Investments made to improve our wastewater system should not only consider the environment, but also the financial ability of citizens to pay for the improvements.	172	132	22	13	51

8.6 Public Meetings

Three public meetings were held to present the proposed Recommended Plan and solicit feedback. The meetings were held on the following dates and locations:

- August 1, 2016: Reardon Center, 520 Minnesota Avenue
- August 3, 2016: Diane Kane Community Center, 3130 North 122nd Street
- August 4, 2016: South Kansas City, Kansas, Library, 3104 Strong Avenue

Over 50 citizens attended the public meetings held in various geographic parts of the community. Information presented at the public meetings included:

- Applicable CWA regulations
- What has been done to date to address CWA regulations and improve the wastewater system
- Where the overflows are happening and what is the extent of the problem
- A summary of the community input to-date and how that influenced the draft IOCP
- What projects are included in the proposed Recommended Plan and timeline to implement them
- What the IOCP impact is on ratepayers

The agenda, presentation materials, and sign-in sheets from the public meetings are provided in Appendix K.

A comment card was developed and distributed during the public meetings. The blank comment card can be found in Appendix L. The meeting attendees were asked whether they agreed with the proposed Recommended Plan to prioritize the repair and renewal of the existing wastewater system. Out of the 24 respondents, 21 indicated that they agreed with the statement. The majority of survey responses also agreed or strongly agreed that investments made to improve our wastewater system should not only consider the environment, but also the financial capability of citizens to pay for improvements. The comment card results are provided in Table 8-6.

Table 8-6: Public Meeting Comment Card Results

Question	Strongly Agree	Agree	Disagree	Strongly Disagree	I Need More Information
State your level of agreement: Investments made to improve our wastewater system should not only consider the environment, but also the financial ability of citizens to pay.	13	7	0	1	3

8.7 Conclusions

Community stakeholders were provided multiple opportunities to provide input into the development of the IOCP. Public input was considered during development of the IOCP. There was general public consensus about the following statements:

- Reducing overflows and improving water quality is important; however, other community issues are more important.
- Resources need to be spent wisely because Wyandotte County is an economically disadvantaged community already facing many other critical infrastructure needs and socioeconomic challenges.
- To avoid creating additional financial hardships on ratepayers, focus initial efforts on the community’s highest priority of renewing the existing infrastructure.
- Keep this large-scale infrastructure investment within our community by positioning young Wyandotte County citizens for future job opportunities related to the IOCP and within the WPCD.
- The Recommended Plan is the community's preferred approach to sewer overflow control.

On August 25, 2016, the UG Board of Commissioners unanimously approved a resolution endorsing and supporting the Recommended Plan as outlined in this IOCP.

9.0 IOCP RECOMMENDED PLAN

9.1 Plan Overview and Benefits

"*EPA has been working with states and cities to make progress on the most important water pollution problems. The Agency will continue to focus on getting raw sewage out of water and reducing pollution from stormwater runoff, using common sense and affordable approaches to tackle the most important problems first and incorporating green infrastructure for cost-effective reduction of pollution while enhancing communities*" (EPA, 2014). The UG agrees with the statements made in the EPA Strategic Plan (EPA, 2014), in particular that common sense and affordable approaches are needed to tackle the most important problems first to make progress addressing water pollution problems.

Minimizing SSOs and CSOs to a level meeting the *CSO Control Policy* presumption approach within a typical 25-year timeframe is not financially feasible for the poorest county in Kansas. The existing wastewater and stormwater infrastructure renewal needs are significant and must be addressed before efforts can be focused directly on overflow control because available funds are severely limited. For these reasons, the UG is proposing an aggressive 10 year, $200 million (2015 $) Recommended Plan for renewing wastewater and stormwater infrastructure and reducing combined and separate sewer overflows.

The UG has focused resources since 2000 in the more economically disadvantaged CSS on sewer separation projects and WWTP and pump station capacity improvement projects resulting in CSO reductions. However, it is now necessary to refocus efforts on system renewal. Presented in this section, the Recommended Plan addresses the community's highest priority, balances the overall plan benefits with the UG's financial capability, and represents the best level of overflow control achievable with the available public investment. The plan is based on the infrastructure condition and regulatory needs assessments presented in Sections 3.0 and 4.0; the alternatives evaluation presented in the *CSS Characterization Report, SSS Characterization Report*, and Sections 5.0 and 6.0; the financial impacts and affordability considerations discussed in Section 7.0; and the input received from multiple stakeholder groups in 2015 and 2016 summarized in Section 8.0.

The UG has considered a range of wet weather issues that impact residents and water quality, public safety, and human health. As a result, the plan is focused on improving the reliability of the system by investing in existing infrastructure that is in the greatest need for repair and potentially has the highest consequence of failure. The Wolcott WWTP expansion project is also a major component of the plan and is necessary to address priority SSOs and to accommodate shifts in the ratepayer base. These system reliability improvements also integrate other wet weather needs including local drainage, streambank erosion, and protection of sewer assets impacted by streambank erosion. Through these planned system reliability improvements, it is anticipated overflow reduction will be achieved. This integrated approach will increase the capacity and reliability of the existing system by addressing the most chronic needs first. This approach will optimize the UG's limited financial capability during the period rates are increased to support the Recommended Plan and for the next phase of the program.

As stressed by internal and external stakeholders, it would be irresponsible to commit to an unaffordable, longer-term plan with questionable water quality benefits and considerable challenges and uncertainties. However, the recommended improvements planned during the next decade (January 1, 2016, through December 31, 2025) are the same projects that would be performed within the same timeframe to achieve a presumption approach level of control during a 25-year or longer timeframe. A Final Measures Plan will be submitted to the EPA in Year 10 that addresses additional overflow control beyond the levels achieved through implementation of this Recommended Plan.

Due to financial and management challenges and uncertainties, the plan must remain flexible and allow the UG time to focus on their existing infrastructure and regather the institutional knowledge and capacity that has recently been lost. After the existing assets are in a more sustainable condition, future efforts, which include an update to this IOCP in year 10 of the plan, are anticipated to create an approach to address the remaining excess overflows and achieve compliance with applicable requirements.

Although not currently a desirable option, committing to Alternative B (25-year plan to achieve 85% wet weather capture to achieve the presumption approach level of control) could be considered. The UG is already committing to the first ten years of this Alternative B. However, fully committing to completing the rest of the program within another 15 years would require significant discussion and negotiation and require rate safeguards to ensure that the community affordability is not compromised.

9.2 Environmental Justice Considerations

The Recommended Plan considered environmental justice issues in the evaluation of alternatives as outlined in the *Plan EJ 2014* and in the *Draft EJ 2020 Action Agenda*. The *Plan EJ 2014* presented the EPA's overarching strategy for advancing environmental justice by seeking to:

- Protect the environment and health in overburdened communities.
- Empower communities to take action to improve their health and environment.
- Establish partnerships with local, state, tribal, and federal governments and organizations to achieve healthy and sustainable communities.

The EJ 2020 Action Agenda, which was recently under public comment, is focused on:

- Deepening environmental justice progress in the EPA's programs to improve the health and environment of overburdened communities.
- Working with partners to expand the EPA's positive impact in overburdened communities.
- Demonstrating progress on significant national environmental justice challenges.

The majority of low-income and minority residents in WyCo live within the CSS area which also has the oldest wastewater infrastructure in the greatest need for renewal. Thus, the entire CSS area is considered an environmental justice area. Understanding that the rate increases necessary to meet CWA requirements would cripple the residents in this environmental justice area, the framework of the Recommended Plan was largely driven by affordability concerns of the UG ratepayers.

Previous overflow control efforts prior to 2015 were focused in the CSS area, which resulted in the reduction of CSOs. The Recommended Plan does not include new facilities within the environmental justice area that may have a negative impact on this area such as new wastewater treatment facilities, storage tanks, storage basins, or pump stations. On the contrary, the proposed projects in this area will have further positive impacts on water quality by reducing CSO discharges to the urban streams and improving sewer infrastructure located in the environmental justice area.

The Recommended Plan also prioritizes the implementation of green infrastructure (CSO 19) within the Big Eleven Lake watershed. This green infrastructure project is a visible investment in an environmental justice neighborhood taking advantage of City-owned and vacant properties. The project will improve the water quality of Big Eleven Lake, which is a highly used park within the urban core. The inclusion of green infrastructure integrates with the Healthy Campus Initiative action items of creating more green space, connecting public spaces, and simulating re-investment in the urban core.

As indicated in Section 8.0, the Recommended Plan was developed with input from a community task force selected to represent disadvantaged citizens within WyCo. Two of the five members of the task force are activists in the local African American and Latino communities, These two members helped notify and educate their constituents within the CSS area (and throughout the entire county) and helped shape the final recommendations to best address environmental and economic concerns and challenges of the lower income and minority population. In addition to the task force, the UG has made a sincere effort to reach as many people as possible by presenting information regarding the IOCP at over 26 neighborhood meetings and community events. These meetings included presentations at numerous locations within the environmental justice area.

By considering the affordability to the environmental justice community, providing positive environmental impacts to the environmental justice area, and providing outreach and opportunities for input to the environmental justice community, the UG has carefully considered environmental justice in the Recommended Plan.

9.3 Projects

As listed in Table 9-1, the Recommended Plan projects are organized by project need, utility, and asset type. These categories and key projects associated with each are presented in the subsequent subsections and shown on Figure 9-1, Figure 9-2, and Figure 9-3. As previously indicated, these projects also represent the first ten years of projects that were identified to achieve a presumption approach level of control in 25-years or longer. Certain projects have been specifically identified; others are grouped into budget categories such as Collection System Upgrade and Renewal Projects to allow necessary flexibility in implementation to achieve the greatest benefits from available funding.

Table 9-1: Recommended Plan Projects

Project[1, 2]	Project Need	Utility	Asset Type	Estimated Cost
Collection System Upgrade and Renewal Projects[2]	Infrastructure Renewal	Wastewater	Collection System	$33,500,000
Sewer Main Extension Projects[2]	Infrastructure Upgrades	Wastewater	Collection System	$1,800,000
Stream Crossing Inspection and Repair Program[2]	Infrastructure Renewal	Wastewater	Collection System	$3,055,000
Lower Connor Creek Interceptor and Pump Station 50 Elimination	SSO Control	Wastewater	Collection System	$5,800,000
Little Turkey Tributary North Interceptor Capacity Improvements	SSO Control	Wastewater	Collection System	$30,000
CSO 19 Overflow Reduction (Green Infrastructure)	CSO Control	Wastewater	Collection System	$4,490,000
CSO 47 Overflow Reduction (Sewer Separation)	CSO Control	Wastewater	Collection System	$1,221,000
Armourdale Phase 1 Sewer Separation (14th and Osage)	CSO Control	Wastewater	Collection System	$1,112,000
Armourdale Phase 2 Sewer Separation (Central Armourdale)	CSO Control	Wastewater	Collection System	$5,299,000
CSO Access Improvements (fences, signage, etc.)	CSO Control	Wastewater	Collection System	$250,000
System-Wide SCADA Improvements	Infrastructure Renewal	Wastewater	Pump Stations and Force Mains	$6,500,000
Pump Station and Force Main Upgrade and Renewal Projects[2]	Infrastructure Renewal	Wastewater	Pump Stations and Force Mains	$15,900,000
Pump Stations 76 and 77 Decommission and Gravity Sewer	Infrastructure Upgrades	Wastewater	Pump Stations and Force Mains	$270,000
Pump Station 15 Decommission and Gravity Sewer	Infrastructure Upgrades	Wastewater	Pump Stations and Force Mains	$562,000
Pump Station and Force Main Capacity Improvements[2]	SSO Control	Wastewater	Pump Stations and Force Mains	$1,366,000
Pump Station Back-Up Power Improvements	Infrastructure Renewal	Wastewater	Pump Stations and Force Mains	$600,000
AID Pump Station Force Main Condition Assessment (and Renewal)	Infrastructure Renewal	Wastewater	Pump Stations and Force Mains	$400,000
FID Force Main Replacement (Phase I)	Infrastructure Renewal	Wastewater	Pump Stations and Force Mains	$2,500,000
FID Pump Station Force Main Condition Assessment (and Renewal)	Infrastructure Renewal	Wastewater	Pump Stations and Force Mains	$200,000
Argentine to Armourdale Siphon Restoration (Junction Box and Gates)	CSO Control	Wastewater	Pump Stations and Force Mains	$800,000

Project[1, 2]	Project Need	Utility	Asset Type	Estimated Cost
CID Dump Station Improvements	Infrastructure Renewal	Wastewater	Treatment Facilities	$1,000,000
Sewer Maintenance Facility	Infrastructure Renewal	Wastewater	Treatment Facilities	$10,800,000
Kaw Point WWTP Investigation and Repair[2]	Infrastructure Renewal	Wastewater	Treatment Facilities	$14,850,000
Kaw Point WWTP Solids Dewatering Facility	Infrastructure Upgrades	Wastewater	Treatment Facilities	$1,000,000
Kaw Point WWTP Digester Rehabilitation	Infrastructure Upgrades	Wastewater	Treatment Facilities	$13,500,000
Kaw Point WWTP Nutrient Removal Study	Anticipated Regulatory Requirements	Wastewater	Treatment Facilities	$200,000
Plant 20 Investigation and Repair[2]	Infrastructure Renewal	Wastewater	Treatment Facilities	$10,850,000
Plant 20 Capacity Upgrade	SSO Control	Wastewater	Treatment Facilities	$7,480,000
Wolcott WWTP Investigation and Repair[2]	Infrastructure Renewal	Wastewater	Treatment Facilities	$550,000
Wolcott WWTP, Phase 1, and Excess Flow Holding Basin	SSO Control	Wastewater	Treatment Facilities	$32,700,000
WWTP 14 Investigation and Repair[2]	Infrastructure Renewal	Wastewater	Treatment Facilities	$60,000
IOCP Implementation - Program Management	Implementation and Compliance	Wastewater	System-Wide	$12,916,000
Stormwater Preliminary Engineering Studies[1]	Infrastructure Renewal	Stormwater	Stormwater	$1,000,000
Stream Bank Stabilization Improvements[2]	Infrastructure Renewal	Stormwater	Stormwater	$900,000
Equivalent Residential Unit (ERU) Storm Water Rate Study	Infrastructure Renewal	Stormwater	Stormwater	$200,000
Turkey Creek Improvements	Infrastructure Renewal	Stormwater	Stormwater	$3,250,000
Storm Sewer Upgrade and Renewal Projects[2]	Infrastructure Renewal	Stormwater	Stormwater	$8,000,000
Drainage System Improvements[2]	Infrastructure Renewal	Stormwater	Stormwater	$14,300,000
Stormwater (MS4) Environmental Compliance	Implementation and Compliance	Stormwater	Stormwater	$4,000,000

Project[1, 2]	Project Need	Utility	Asset Type	Estimated Cost
Anticipated Future MS4 Permit Compliance Capital Projects	Anticipated Regulatory Requirements	Stormwater	Stormwater	$1,300,000
Flood Pump Station Rehabilitation	Infrastructure Renewal	Stormwater	Flood Control	$2,700,000
New Turkey Creek Flood Control O&M	Infrastructure Renewal	Stormwater	Flood Control	$1,350,000
Strong Avenue Flood Pump Station Rehabilitation	Infrastructure Renewal	Stormwater	Flood Control	$1,200,000

Notes:

1. Preliminary descriptions of recommended projects are available. The UG reserves the right to revise the recommended projects, sizing, and schedule through an adaptive management approach.
2. Although some shorter-term projects have been identified, specific projects will be identified through planned investigations and condition assessments throughout the 10-year period. Funds are allotted on an annual basis to address highest prioritized needs and allow flexibility and adaptability.

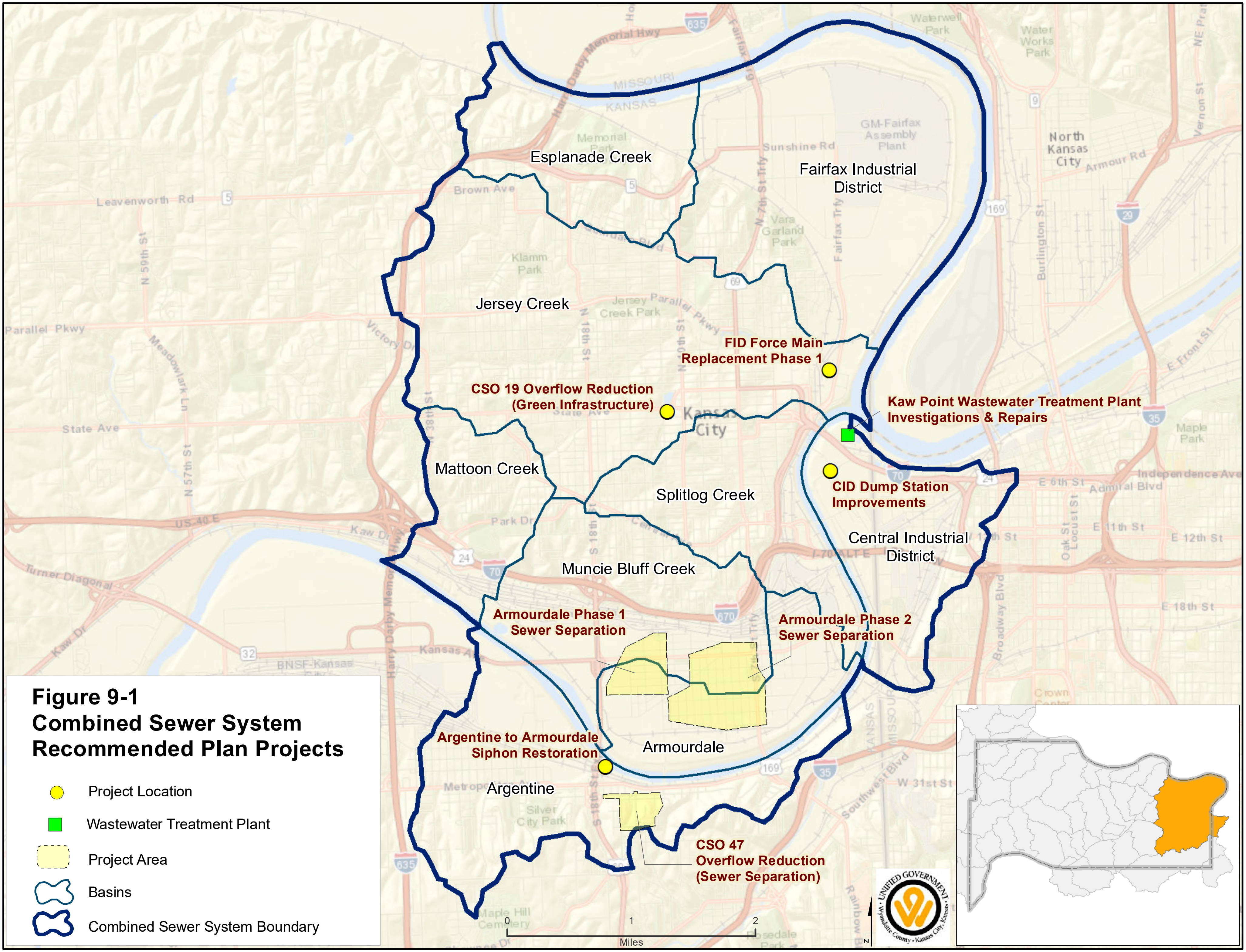


Figure 9-1
Combined Sewer System Recommended Plan Projects

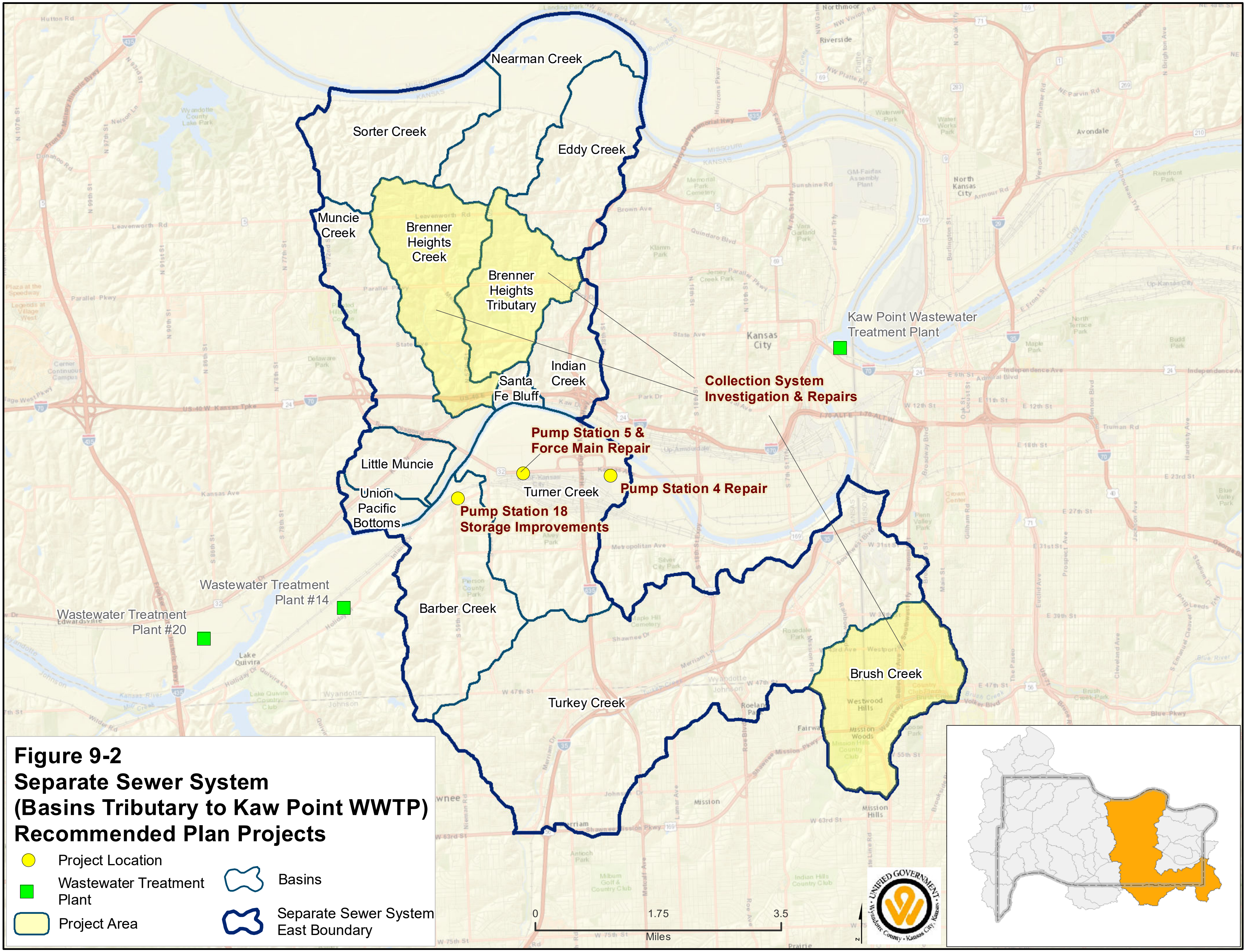


Figure 9-2
Separate Sewer System
(Basins Tributary to Kaw Point WWTP)
Recommended Plan Projects

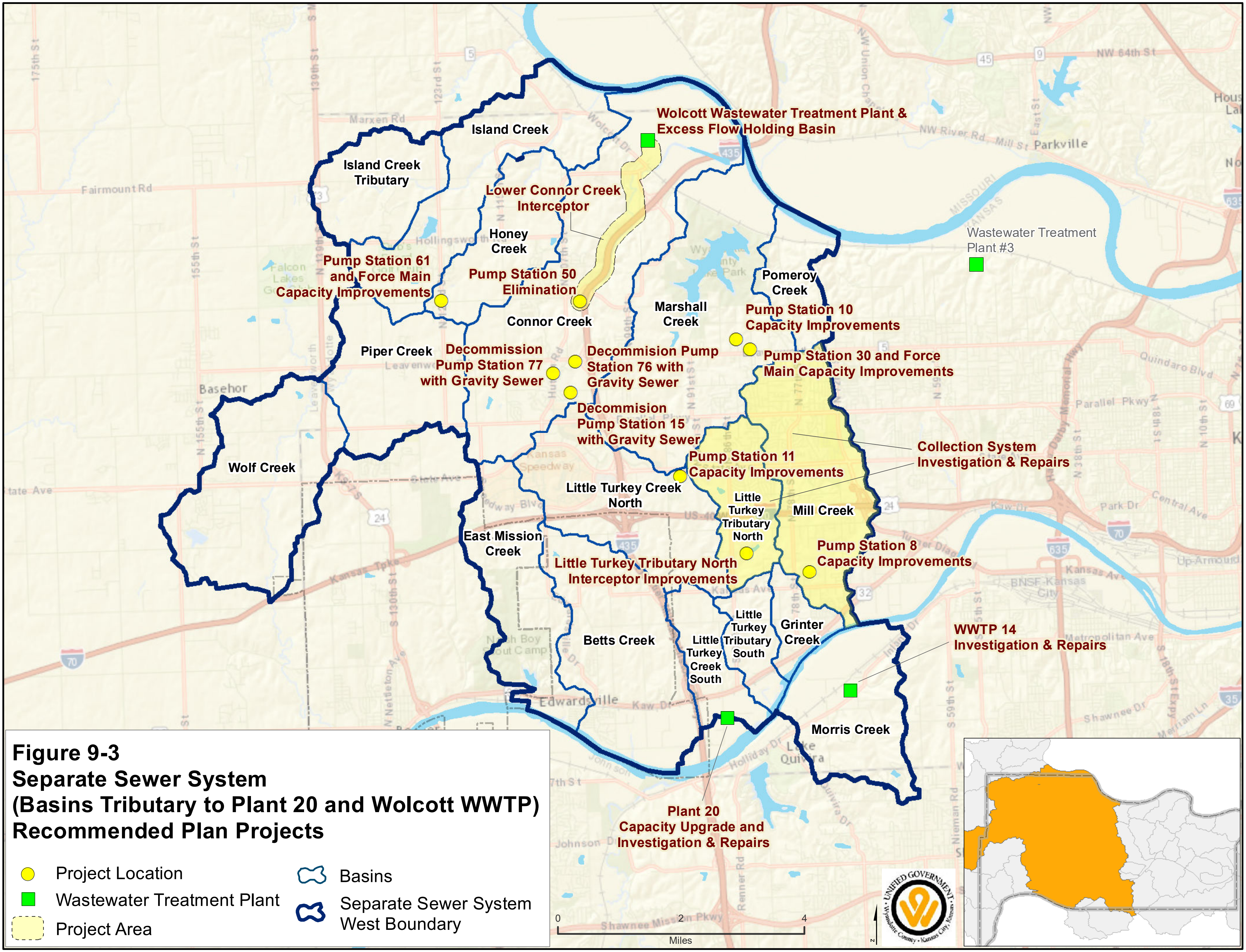


Figure 9-3
Separate Sewer System
(Basins Tributary to Plant 20 and Wolcott WWTP)
Recommended Plan Projects

As previously indicated, the recommended projects were categorized by the following project needs:

- Infrastructure Renewal. These projects are designed to renew existing infrastructure. Infrastructure includes the wastewater and stormwater systems. Most of these projects will be specifically identified during investigation and condition assessment efforts throughout the 10-year period. Private I/I reduction will be evaluated during investigation and design efforts.
- Infrastructure Upgrades. These projects are designed to replace existing infrastructure with upgraded and/or larger capacity infrastructure.
- SSO Control. Although several secondary benefits will be achieved, these projects are designed primarily to reduce SSOs.
- CSO Control. Although several secondary benefits will be achieved, these projects are designed primarily to reduce CSOs.
- Implementation and Compliance. These are projects necessary to implement the Recommended Plan and include program management, public outreach, implementation monitoring and reporting, and development of the Final Measures Plan.
- Anticipated Regulatory Requirements. These projects include a Kaw Point WWTP nutrient removal study and funds set aside to construct several capital projects that are anticipated to be required to comply with the future MS4 Permit. Projects that reduce the potential discharge of water with high levels of fecal coliform from separate storm sewer discharges and nonpoint sources should be given high priority.

9.4 Capital Costs

The estimated capital costs of the Recommended Plan projects are provided in Table 9-1. Local and regional engineer and construction contractor capacity and availability due to similar sewer system improvement efforts throughout the region may result in construction cost escalation over the course of the implementation period. Any stipulated penalties assessed during the 10-year period related to past or future compliance issues are not accounted for in the Recommended Plan cost. In addition, costs associated with other anticipated and unanticipated regulatory compliance efforts not specifically noted are not accounted for in the Recommended Plan cost.

The identified Recommended Plan project costs exceed $225 million; however, to account for flexibility and uncertainty, the UG is committing $200 million for this effort.

9.5 Implementation Schedule

While financially challenging, a 10-year implementation schedule provides opportunity to improve plan implementation outcomes. For example, a 10-year plan:

- Would allow the UG to build needed internal staffing capacity and institutional knowledge recently lost due to staff retirements and attrition.
- Could be incorporated into multiple Kaw Point WWTP NPDES Permits reducing administrative and legal costs to the UG and regulatory agencies. The Kaw Point WWTP is currently operating under an expired NPDES permit.
- Would allow time to see if the Water Resources Development Act of 2016 (WRDA) passes through Congress. As currently written, the WRDA authorizes grants to small and disadvantaged communities and strengthens funding to the SRF programs. The UG could potentially benefit from these grants and increases in SRF funding.

- Would allow time to see changes in the determination of affordability. For example, the aforementioned WRDA (as currently written) requires revision of the 1997 affordability guidance.
- Would allow time to consider the results of an EPA study on low-income ratepayer subsidy programs, which could potentially provide ratepayer relief. This study is also part of the aforementioned WRDA (as currently written).
- Would allow the EPA more time to collect and analyze data regarding the overall CSO reduction impacts on water quality and the link between improved water quality from CSO reduction and public health.

After several initial IOCP development efforts were completed in 2015, including the financial capability and infrastructure condition assessments, the proposed short-term capital improvement needs became apparent. Not wanting to delay necessary improvements and to move forward in a good faith effort, the UG began initial planning and design efforts on these capital improvement needs. Thus, the proposed 10-year plan was initiated on January 1, 2016, and extends to December 31, 2025.

The UG has continued their aggressive commitment to wastewater and stormwater capital improvements as the IOCP has been finalized. A noteworthy volume of recommended plan projects have been completed since January 1, 2016, and are currently in progress as of September 2016. The proposed implementation schedule for the major recommended capital projects in the Recommended Plan is provided in Table 9-2 and further reinforces the UG's commitment to renew their infrastructure and reduce sewer overflows.

Table 9-2: Recommended Plan Implementation Schedule

Project	Completion of Design	Commencement of Construction	Substantial Completion
Lower Connor Creek Interceptor and Pump Station Elimination (PS 50)[1]	July 1, 2019	January 1, 2020	December 31, 2021
FID Force Main Replacement (Phase I)	January 31, 2017	July 31, 2017	July 31, 2018
System-Wide SCADA Improvements	December 31, 2017	July 1, 2018	December 31, 2019
CSO 19 Overflow Reduction (Green Infrastructure)[3]	December 31, 2019	June 1, 2020	July 31, 2022
CSO 47 Overflow Reduction (Sewer Separation)	December 31, 2024	June 1, 2025	December 31, 2026
Armourdale Phase 1 Sewer Separation (14th and Osage)	December 31, 2022	June 1, 2023	August 31, 2024
Armourdale Phase 2 Sewer Separation (Central Armourdale)	December 31, 2023	June 1, 2024	December 31, 2025
Argentine to Armourdale Siphon Restoration (Junction Box and Gates)[2]	July 1, 2024	November 1, 2024	December 31, 2025

Project	Completion of Design	Commencement of Construction	Substantial Completion
Wolcott WWTP, Phase 1, and Excess Flow Holding Basin[1]	July 1, 2019	January 1, 2020	December 31, 2021
Final Measures Plan Submittal	December 31, 2025	-	-

Notes:
1. This project will require land acquisition; thus, implementation schedule dates are approximate.
2. This project will require coordination with the USACE Strong Avenue Flood Pump Station Project; thus, implementation schedule dates are approximate.
3. This project will require coordination with the UG's Healthy Campus Initiative; thus, implementation schedule dates are approximate.

As discussed, the UG faces a number of challenges to meet CWA requirements and improve water quality. The UG is committed and has begun to aggressively make progress on improving infrastructure reliability and reducing overflows. However, there are numerous uncertainties that cloud the anticipated effectiveness, schedule, and costs of planned improvements. These uncertainties require a plan that is flexible and adaptive and include:

- The timing and magnitude of future regulatory compliance requirements, such as nutrient removal at the WWTPs and MS4 Permit requirements to address TMDLs, is unclear.
- Effectiveness of overflow reduction related to improvements that are difficult to quantify, such as an enhanced FOG program, CMOM activities, SCADA system improvements, green infrastructure, and I/I reduction, are uncertain at this time, and will affect capital spending.
- Local and regional engineer and construction contractor capacity and availability due to similar sewer system improvement efforts throughout the region are anticipated to result in unquantified (at this time) but likely construction cost escalation.
- Accuracy of current financial assumptions, such as changes in household MHI over time, impacts and degree of rate tolerance, and population growth trends (which have been negative), will significantly affect residential affordability and the UG's ability to generate additional revenue.
- Accuracy of current technical assumptions, such as capital cost estimates, infrastructure renewal costs determined by extrapolation, and WWTP wet weather capacity, will affect the magnitude of capital projects.
- Although project costs have been determined based on actual inspections and hydraulic modeling, the amount of infrastructure that has not been inspected and modeled remains significant.
- Federal flood control levee improvement needs that are defined in a recent USACE study may exceed $100 million (local share), but the timing and level of commitment are unknown. The magnitude of this obligation will affect residential and utility affordability considerably.
- Local drainage issues that are priority concerns for stakeholders in relation to sewer overflow control due to their impact on private property
- The timing and magnitude of infrastructure necessary to serve population shifts and anticipated growth. Although estimated with information provided by the UG Land Use and Planning Department, actual growth can vary wildly from projected growth. For example, the UG needs to plan for the Wolcott WWTP, Phase II, but the timing for it may change several times.

With the many uncertainties, the plan must be flexible and adaptive. A plan that accounts for improvement needs but is able to adapt and react to these uncertainties, will maximize limited financial resources and maximize benefits to the community and water quality.

9.6 Overflow Reduction Impacts

In addition to the UG's previous CSO control and infrastructure renewal efforts between 2000 and 2015, implementation of the Recommended Plan will improve existing infrastructure reliability; reduce overflow volume at chronic, recurring SSO locations; and reduce CSO volume.

9.6.1 CSOs

The recommended CSO control projects are primarily sewer separation. The water quality benefits associated with the separation are not as substantial as those obtained from other potential CSO control technologies due to the bacteria loading present in separate storm water discharges. However, the primary benefit of these projects is to reduce street flooding in the Armourdale and Argentine Basins, which has been identified by numerous residents as a significant local issue to address. Sewer separation has also been encouraged by the KDHE especially when discharging to urban streams.

In addition to the street flooding benefit, the Recommended Plan will reduce CSO volume and increase the wet weather percent capture as detailed in Table 9-3 and Table 9-4 for the receiving water and primary CSS pump station service areas, respectively. The overflow volume reductions at each CSO diversion structure are provided in Table 9-5. After completion of the sewer separation and green infrastructure projects in the Recommended Plan, modeling indicates that the wet weather percent capture will increase to 73.1% and the volume of overflow during the Design Year will be reduced by 20%.

Table 9-3: Recommended Plan - Modeled CSO Reduction by Receiving Water (Design Year)

Metric	Existing Conditions (2000)	Existing Conditions (2013)	Recommended Plan (2025)
Annual Overflow Volume (MG)	1031	844	675
Missouri River [1]	643	479	450
Kansas River [2]	388	365	225
Jersey Creek	152	69	55
Mattoon Creek	0.14	0.14	0.14
% Capture, Wet Weather Flow	66.6%	70.5%	73.1%

Notes:
1. Missouri River overflow volumes include Jersey Creek overflow volumes.
2. Kansas River overflow volumes include Mattoon Creek overflow volumes.

Table 9-4: Recommended Plan - Modeled CSO Reduction by Primary CSS Pump Station Service Area (Design Year)

Metric	Existing Conditions (2000)	Existing Conditions (2013)	Recommended Plan (2025)
Annual Overflow Volume (MG)	1031	844	675
FID Pump Station	643	479	450
CID Pump Station	3	0.14	0.14
AID Pump Station	385	365	225

Metric	Existing Conditions (2000)	Existing Conditions (2013)	Recommended Plan (2025)
Percent Capture, Wet Weather Flow	69.2%	70.5%	73.1%
FID Pump Station	49.3%	56.1%	57.8%
CID Pump Station	90.9%	99.2%	99.3%
AID Pump Station	78.5%	79.1%	84.2%

Table 9-5: Recommended Plan - Modeled CSO Reduction by CSO Diversion Structure (Design Year)

CSO Diversion Structure	Existing Conditions	10-Year Improvements	10-Year CSO Disposition[1]
	Annual Overflow Volume (MG)	Annual Overflow Volume (MG)	
Overall Combined Sewer System	844.48	675.30	
FID Pump Station Basin	478.74	449.80	
Jersey Creek	76.28	61.12	
CSO 01	0.11	0.11	No Change
CSO 02	0.57	0.57	No Change
CSO 03	0.56	0.56	No Change
CSO 04	0.76	0.76	No Change
CSO 05	1.16	1.16	No Change
CSO 08	0.00	0.00	No Change
CSO 09	0.15	0.15	No Change
CSO 10	0.04	0.04	No Change
CSO 11	0.00	0.00	No Change
CSO 14	4.80	4.80	No Change
CSO 15	0.54	0.54	No Change
CSO 16	0.73	0.73	No Change
CSO 17	0.51	0.51	No Change
CSO 18	0.00	0.00	No Change
CSO 19	21.80	7.85	Partial separation of the upstream combined system
CSO 20[2]	0.00	0.00	Closed
CSO 21	0.00	0.00	No Change
CSO 22	0.00	0.004	No Change
CSO 23	0.01	0.00	No Change

CSO Diversion Structure	Existing Conditions	10-Year Improvements	10-Year CSO Disposition[1]
	Annual Overflow Volume (MG)	Annual Overflow Volume (MG)	
CSO 25	0.06	0.06	No Change
CSO 26	0.25	0.25	No Change
CSO 53	0.05	0.05	No Change
CSO 55	35.69	35.43	No Change
CSO 62	0.03	0.03	No Change
CSO 65	0.10	0.10	No Change
CSO 80	0.53	0.53	No Change
CSO 81	0.76	0.76	No Change
CSO 82[2]	0.00	0.00	Closed
CSO 84	0.00	0.00	No Change
CSO 85	0.01	0.00	No Change
CSO 86	7.04	6.11	Partial Separation of upstream combined system
CSO 87[2]	0.00	0.00	Closed
Esplanade/FID	402.45	388.68	
CSO 27	7.30	7.30	No Change
CSO 28	36.60	36.60	No Change
CSO 29	1.52	1.52	No Change
CSO 30	7.75	7.75	No Change
CSO 31	0.21	0.21	No Change
CSO 54	339.69	325.92	No Change
CSO 56	9.38	9.38	No Change
CID Pump Station Basin	0.14	0.13	
CSO 32	0.14	0.13	No Change
CSO 35[2]	0.00	0.00	Closed
CSO 36[2]	0.00	0.00	Closed
CSO 37[2]	0.00	0.00	Closed
CSO 68[2]	0.00	0.00	Closed
CSO 69[2]	0.00	0.00	Closed
CSO 83[2]	0.00	0.00	Closed
CSO 88[2]	0.00	0.00	Closed

CSO Diversion Structure	Existing Conditions Annual Overflow Volume (MG)	10-Year Improvements Annual Overflow Volume (MG)	10-Year CSO Disposition[1]
AID Pump Station Basin	365.37	225.37	
Splitlog Creek	180.50	156.87	
CSO 39	1.13	1.13	No Change
CSO 44	179.28	155.75	No Change
Muncie Bluff Creek	0.94	0.94	
CSO 64	0.94	0.94	No Change
Armourdale	99.61	17.58	
CSO 41	0.09	0.00	Partial separation of the upstream combined system
CSO 42	9.27	0.00	Partial separation of the upstream combined system
CSO 43	85.13	17.44	Partial separation of the upstream combined system
CSO 66	5.12	0.14	No Change
Mattoon Creek	0.14	0.14	
CSO 51	0.14	0.14	No Change
CSO 52	0.00	0.00	No Change
Argentine	84.28	49.83	
CSO 47	2.61	0.00	Partial separation of the upstream combined system
CSO 48	81.67	49.83	Partial separation of the upstream combined system

Notes

1. Options for CSO disposition include: a) closed, b) partial separation of the upstream combined system, c) diversion of the CSO flow to another CSO, d) diversion of the CSO flow to storage for retention and/or subsequent treatment, e) treatment and/or disinfection of the CSO flow with discharge at the CSO location, and f) no change.
2. CSO locations that have been closed due to previous sewer separation.

9.6.2 SSOs

The Recommended Plan will reduce SSO volume as detailed in Table 9-6. After completion of the Recommended Plan, modeling indicates that the volume of overflow during the two-year storm event will be reduced by 84% with most of this reduction occurring at PS 6. In addition, the number of non-modeled pump stations projected to overflow during the design storm is cut in half and over half the SSS basins will have a level of service greater than a five-year storm event.

Table 9-6: Recommended Plan - Modeled SSO Reduction (Two-Year Storm Event)

Metric[1]	Existing Conditions			10-Year Improvements[2]		
	Basins Tributary to Plant 20 and Wolcott WWTP	Basins Tributary to Kaw Point WWTP	SSS (total)	Basins Tributary to Plant 20 and Wolcott WWTP	Basins Tributary to Kaw Point WWTP	SSS (total)
Total Overflow Volume (gal)	1,273,765	134,400	1,408,165	124,180	102,300	226,480
Percent Reduction in Total Overflow Volume from Existing Conditions[3]	-	-	-	90%	24%	84%
Number of Non-Modeled Pump Stations Projected to Overflow	5	5	10	0	5	5
Number of SSS Basins with ≥ Two-Year Level of Service	10	4	14	12	4	16
Number of SSS Basins with ≥ Five-Year Level of Service	9	3	12	11	4	15

Notes:

1. All metrics determined from the SSS model, except for the non-modeled pump stations metric. Non-modeled pump stations projected to overflow determined from projected flows as determined in the *SSS Characterization Report*.
2. While renewal of the collection system will likely reduce I/I, 10-year improvements assume no I/I removal in the SSS. It assumes 50% of the 20-year projected growth as determined in the *SSS Characterization Report*.
3. Overflow reduction quantification applies to the modeled system only and does not include reduction in overflows at non-modeled pump stations.

9.7 Water Quality Impacts

The water quality model simulations indicate that the Recommended Plan is adequate to demonstrate compliance with the *CSO Control Policy* for the Kansas and Missouri Rivers. The water quality model simulations indicate that the Recommended Plan is adequate to demonstrate compliance with the *CSO Control Policy* for Mattoon Creek.

Under existing conditions and after implementation of the Recommended Plan, the secondary contact criterion in Jersey Creek is met during all recreation months. There is also improvement in Jersey Creek water quality with Recommended Plan implementation.

Construction of the expanded Wolcott WWTP along with the rerouting of flows from PS 50 to the WWTP decreases the magnitude and frequency of SSOs within the SSS. Rerouting flow will also lead to other water quality benefits due to improved wastewater treatment processes at the expanded Wolcott WWTP and reduced loadings at Plant 20. An average daily flow of approximately 1 mgd currently treated at Plant 20 will be rerouted to the expanded WWTP resulting in immediate reductions in nutrient loading to the

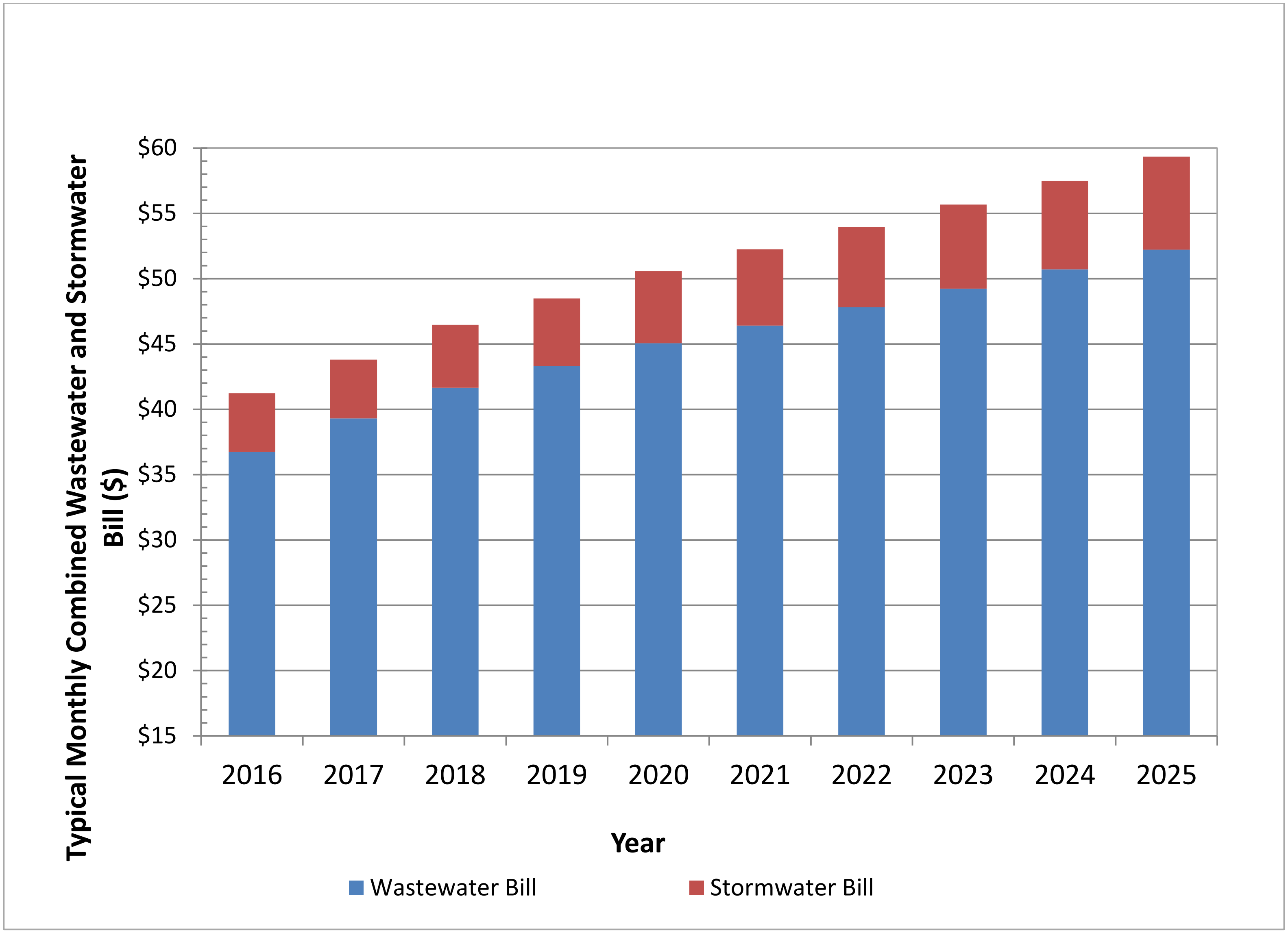
Kansas River, which is impaired for phosphorus. This flow, along with the flow currently treated at the Wolcott WWTP, will receive a higher level of treatment, i.e., Biological Nutrient Removal (BNR). While there are no existing effluent limits in place for nitrogen and phosphorous at Plant 20, the expanded Wolcott WWTP is anticipated to have effluent limits of 10 mg/l of TN and 1 mg/l of TP resulting in a net reduction of TN and TP discharges. Improved effluent quality at the Wolcott WWTP will also have a direct and positive impact on water quality in Connor Creek, including reduced ammonia and nutrient levels.

9.8 Financial Impacts

The UG spent tens of millions of dollars on previous CSO control efforts between 2000 and 2015. This next phase will be an adaptive 10-year plan (2016 to 2025) that implements the most critical system reliability improvements while also providing overflow control reductions. This is an aggressive commitment, totaling approximately $200 million in integrated wastewater and stormwater capital improvements.

Implementation of this plan will require the UG to raise sewer user rates and stormwater fees (as shown on Figure 9-4) to their already economically-disadvantaged ratepayers over the next decade to approximately 1.90% MHI (estimated in year 2025) that is not only burdensome, but considered “High Burden” for this community.

Figure 9-4: Projected Typical Residential Monthly Wastewater and Stormwater Bills



Sources: Unified Government of Wyandotte County Finance Department

The expanded Wolcott WWTP will have to be debt financed, as will many of the other proposed capital projects over the duration of the plan. The necessary debt financing is estimated to reduce the utility's debt coverage ratio to 1.5 in 2025 and increase the debt payments as a percent of revenue from 21% to 35%.

Revenues under existing rates are not adequate to meet the Recommended Plan funding requirements and necessitate annual rate increases. Through Year 10, increases in wastewater and stormwater rates produce a cumulative increase in revenue of approximately 44% over current levels. The plan also requires an aggressive increase in debt issuance with a resultant weakening in the debt service coverage ratio as previously indicated. This assumes that the necessary new debt issuance will be approved in the amount, within the schedule, and for the projects proposed to be funded.

The UG intends to seek preferred term Kansas State Revolving Fund (SRF) Loans as an alternate source of debt funding. In addition, grant opportunities will be reviewed, including Section 319 Nonpoint Source Management Program grants. If the SRF program or other state and federal programs can provide further interest subsidies, principal forgiveness, or grants, higher levels of overflow control may become achievable during the 10-year period without further financial hardship.

9.9 Operational Plan

During implementation of the Recommended Plan, several operational changes will be required. The more significant operational changes include:

- Increase staff due to the Wolcott WWTP expansion.
- Modify O&M activities due to the elimination of several pump stations.
- Modify WWTP O&M activities due to the Wolcott WWTP expansion and Plant 20 capacity upgrade.
- Adjust operation of PS 6 after the Plant 20 capacity upgrade is complete.
- Modify operation activities based on improved monitoring due to the SCADA system improvements.

9.10 Implementation Monitoring and Reporting

A post-construction compliance monitoring program is typically necessary to monitor and measure the effectiveness of a combined sewer overflow control program. Through the collection of flow, rainfall, and water quality data, and other monitoring activities throughout program implementation before, during, and after completion of individual projects a post-construction compliance monitoring program is designed to:

- Measure compliance with water quality standards and protection of designated uses.
- Assess and document the environmental benefits attributable to CSO control measures and SSO mitigation actions.
- Update and enhance the collection system computer models.
- Provide public education and information on the need for implementation of the CSO control measures and SSO mitigation actions, any water quality improvements, and the progress made in achieving the performance criteria.

Although the Recommended Plan includes three projects to reduce combined sewer overflow volume, the 10-year plan alone will not result in compliance with water quality standards or protection of designated uses. As a result, in lieu of a post-construction compliance monitoring program, an implementation monitoring and reporting program is included annually for the duration of the Recommended Plan. It consists of the following.

- Capital Projects Summary.
- Plan and Implementation Progress Schedule Update.
- Resource and Financial Capability Update.
- Public Education and Involvement Activities Summary.
- Programmatic Activities Summary.
- Operations Activities Summary.
- Collection System Release Log.
- Hydraulic Model Update.
- Other Stipulated Monitoring.
- Plan Update Monitoring.

The implementation monitoring and reporting program will:

- Document infrastructure renewal, CSO control, and SSO mitigation actions.
- Monitor compliance with the Recommended Plan.
- Measure the effectiveness of the green infrastructure pilot project in the CSS.
- Update and enhance the collection system and receiving water computer models.
- Provide public education and information on the need for implementation of wet weather solutions and the progress made in implementing the Recommended Plan.
- Provide updated information for future planning of the long term IOCP.

9.10.1 Capital Projects Summary

The status of all capital projects will be tracked and reported annually to the EPA and the KDHE to monitor implementation progress of the Recommended Plan. Each capital project summary will include the following:

- Brief project description with appropriate metrics, e.g., estimated length of sewer to be repaired.
- Current project phase (field investigation/study, design, bid/construction, or completed).
- Project budget tracking along with a comparison to the Recommended Plan amounts by project category, asset, and utility.
- Project category (infrastructure renewal, infrastructure upgrades, SSO control, CSO control, implementation and compliance, or regulatory requirement).
- Asset type (collection system, pump stations and force mains, treatment facilities, stormwater, flood control, or system-wide).
- Utility (wastewater or stormwater).

9.10.2 Plan and Implementation Progress Schedule Update

Project progress such as completion of design, commencement of construction, and substantial completion will be updated and compared to the Recommended Plan Implementation Schedule. As part of its adaptive management approach, recommended and necessary plan approach, project, and schedule revisions will also be submitted.

9.10.3 Resource and Financial Capability Update
On an annual basis, key resource and financial indicators for the UG service area will be documented and compared to FCA and Recommended Plan assumptions. Monitoring of these indicators will allow the UG to make more informed choices on the timing, budgets, and financing of projects. Indicators that will be documented and compared to Recommended Plan assumptions include the following: median household income, wastewater user rates, stormwater fees, total annual revenue collected, total debt as a percentage of revenue, and debt service coverage ratio. Commentary on unplanned expenditures, staffing levels, and other key assumption deviations will also be documented.

9.10.4 Public Education and Involvement Activities Summary
Active citizen participation will be critical to the overall success of the Recommended Plan and future planning for the overall IOCP. Public outreach efforts will continue during the 10-year plan to inform the public about the need for water quality improvements, plan compliance, proposed project designs and schedules, and priority area identification. These public education and involvement activities will be documented and reported annually.

9.10.5 Programmatic Activities Summary
A brief summary of key activities performed for the major programmatic activities listed below will be documented and reported annually:

- IMS.
- FOG Control Program Plan.
- SMP.
- NMC Plan.
- CMOM Program.

9.10.6 Operations Activities Summary
A summary of numerous operations activities will continue to be documented and reported annually. Quantities performed by the UG and by outside contractors will be recorded for the following metrics:

- Length of sewer cleaned.
- Length of sewer televised.
- Length of sewer repaired, rehabilitated, and replaced.
- Number of service lateral connection repairs.
- Number of manholes inspected.
- Number of manholes repaired, rehabilitated, and replaced.
- Length of force main inspected.
- Length of force main repaired, rehabilitated, and replaced.
- Number of pump station inspections.

9.10.7 Collection System Release Log
An updated collection system release log that summarizes SSOs, unauthorized CSOs, and bypasses (including the date, location, associated WWTP service area, estimated volume, rainfall event, and cause) will continue to be documented and reported annually.

9.10.8 Hydraulic Model Update

Any updates to the CSS and SSS hydraulic models performed during the 10-year plan will be documented and reported annually. Anticipated updates include incorporating completed projects and operational improvements.

9.10.9 Other Stipulated Monitoring

Other monitoring will occur during the 10-year plan as stipulated by other plans and permits. Results from these monitoring efforts will be reported as required in the appropriate permits and will not be reported separately as part of this Recommended Plan implementation monitoring and reporting program. This other monitoring includes stormwater and receiving water quality monitoring required by the MS4 Permit and WWTP monitoring required by the NPDES Permits.

9.10.10 Plan Update Monitoring

Following implementation of the Recommended Plan, an update to the Plan will be prepared and submitted to address the remaining overflows, achieve compliance with CWA requirements, and address regulatory issues. A number of monitoring efforts will be performed prior to submittal of the plan update as needed to provide the data necessary to update the Recommended Plan as described in the sub-sections that follow. The results of these monitoring efforts will be documented in the plan update.

9.10.10.1 Flow and Rainfall Monitoring

Temporary flow and rainfall monitoring will be performed as needed to support the plan update effort. Updated dry and wet weather flow characteristics will be used to update and re-calibrate the hydraulic models in selected locations.

9.10.10.2 Water Quality Monitoring

Water quality monitoring will be performed to update the existing conditions characterization of the CSO receiving streams. This characterization will be used to update the water quality models. In addition, applicable water quality standards, 303(d) impairment listings, sensitive areas, and TMDLs will be reviewed and any updates will be incorporated into the characterization.

9.10.10.3 Green Infrastructure Pilot Project Monitoring

Upon completion of the CSO 19 green infrastructure project, monitoring will be performed to evaluate the effectiveness of the selected controls in reducing wet weather overflows in the CSS. Quantification of the capture volumes, infiltration rates, and downstream benefits will be used for future green infrastructure and long term IOCP planning. The results will be included in the Final Measures Plan.

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Appendix A –

Partial Consent Decree

IN THE UNITED STATES DISTRICT COURT
DISTRICT OF KANSAS

UNITED STATES OF AMERICA,	**)**	
	)	
Plaintiff,	**)**	
	)	
v.	**)**	**Civil Action No.**
	)	
UNIFIED GOVERNMENT OF WYANDOTTE COUNTY AND KANSAS CITY, KANSAS,	**)**	
	)	
and	**)**	
	)	
THE STATE OF KANSAS,	**)**	
	)	
Defendants.	**)**	

PARTIAL CONSENT DECREE

TABLE OF CONTENTS

Contents

APPENDICES

A. List of NPDES Permits for Unified Government's WWTPs and MS4
B. Sewershed Map
C. Estimated SSS/CSS Hydraulic Model Network
D. Combined Sewer Overflow Outfalls and Diversion Structures
E. Storm Water Management Plan
F. Fats, Oil and Grease Control Program Plan
G. Collection System Release Response Plan
H. Nine Minimum Controls Plan

INTRODUCTION

WHEREAS, Plaintiff, the United States of America ("United States"), by the authority of the Attorney General of the United States, acting at the request and on behalf of the Administrator of the United States Environmental Protection Agency ("EPA"), filed a Complaint alleging that Defendant, Unified Government of Wyandotte County and Kansas City, Kansas ("Unified Government"), violated the Clean Water Act, 33 U.S.C. § 1251, *et seq.* ("CWA" or "Act"), and seeking injunctive relief and civil penalties pursuant to Section 309(b) and (d) of the CWA, 33 U.S.C. § 1319(b) and (d).

WHEREAS, the Unified Government is a governmental entity organized and existing under the laws and constitution of the State of Kansas and a "municipality" pursuant to Section 502(4) of the CWA, 33 U.S.C. § 1362(4).

WHEREAS, the United States' Complaint also names the State of Kansas ("State") as a defendant in this action, thereby satisfying the requirements of Section 309(e) of the CWA, 33 U.S.C. § 1319(e).

WHEREAS, the State, through the Kansas Department of Health and Environment ("KDHE"), has been authorized by EPA to administer the National Pollutant Discharge Elimination System ("NPDES") permit program, pursuant to Section 402 of the CWA, 33 U.S.C. § 1342.

WHEREAS, the Unified Government owns and operates a Publicly Owned Treatment Works ("POTW") that includes wastewater collection, retention, transmission and treatment systems to collect and convey municipal sewage (domestic, commercial and industrial) to its wastewater treatment plants ("WWTPs") or to its combined sewer overflow outfalls ("CSO Outfalls"), and is the holder of NPDES permits issued by KDHE authorizing the discharge of pollutants from certain outfalls.

WHEREAS, the Unified Government's Sewer System consists of a combined sewer system ("CSS") located within the eastern portion of Wyandotte County, and a separate sanitary sewer system ("SSS") in the Unified Government's jurisdiction in the remainder of Wyandotte County, with portions of the Sewer System in the primarily CSS area also consisting of some SSS lines.

WHEREAS, the Unified Government's management of the CSS and discharges from CSO Outfalls are subject to the terms and conditions of an NPDES Permit No. KS0038563, issued for WWTP #1, also known as the Kaw Point WWTP, (hereafter, the "Kaw Point Permit").

WHEREAS, the Unified Government prepared and submitted to KDHE a Long Term Control Plan ("LTCP") in November 2000, pursuant to the requirements of the Kaw Point Permit, for continued operation and management of the CSS consistent with the requirements of the CWA.

WHEREAS, the Unified Government is required by the CWA, its implementing regulations and the Kaw Point Permit to implement the nine minimum controls ("NMCs") for proper operation and maintenance of the CSS.

WHEREAS, in January 2007, EPA conducted an inspection to determine the Unified Government's compliance with NPDES permit requirements for its Sewer System. Based on information developed by EPA during the inspection, EPA has identified various violations, including but not limited to, dry weather overflows from CSO Outfalls and discharges from the Sewer System at unauthorized locations. EPA has further determined, that the Unified Government's LTCP, as presently drafted, is inadequate to comply with EPA's 1994 CSO Policy ("CSO Policy"), adopted by reference into Section 402(q) of the CWA, 33 U.S.C. § 1342(q).

WHEREAS, in October 2009, EPA conducted an inspection of portions of the Unified Government's collection system and the Kaw Point WWTP and WWTP #20 to evaluate the Unified Government's compliance with NPDES permit requirements. EPA identified various alleged violations, including but not limited to, constructed SSOs, continued utilization of CSO Outfalls previously reported as abandoned by the Unified Government, and outfalls identified as CSO discharge points with little or no known stormwater contribution.

WHEREAS, this Partial Consent Decree requires the Unified Government to fully implement the NMCs and to develop and submit to EPA for review and approval, with a copy to the State, an Integrated Overflow Control Plan ("IOCP"), containing elements appropriate under the CSO Policy for a LTCP and plans for the continued improvement of its SSS.

WHEREAS, this Partial Consent Decree further requires the Unified Government to implement certain short-term construction projects and ongoing programmatic activities for the

Sewer System as set forth in Section VII. The Unified Government estimates that these projects will cost approximately $20 million dollars.

WHEREAS, the Parties recognize that the work required by this Partial Consent Decree will not fully resolve the United States' claims alleged in the Complaint for either injunctive relief or civil penalties.

WHEREAS, the Unified Government owns and operates a Municipal Separate Storm Sewer System ("MS4") in the jurisdictional area of the Unified Government pursuant to NPDES Permit No. KS0095656 ("MS4 Permit"), issued by KDHE and effective January 2001 and most recently reissued and effective October 2007. The MS4 Permit authorizes discharges from the Unified Government's MS4, in accordance with specified conditions.

WHEREAS, in November 2007, EPA conducted a performance evaluation of the Unified Government's MS4 program. Based on information developed by EPA during the inspection, EPA has identified various violations by the Unified Government of its MS4 Permit.

WHEREAS, the Unified Government, in 2000, prepared and submitted a Stormwater Management Plan ("SWMP") to KDHE as a condition of being issued the 2001 MS4 Permit, and in October 2008, submitted a revised SWMP to KDHE as a condition of the reissued 2007 MS4 Permit. EPA and KDHE determined that the Unified Government's 2008 SWMP was inadequate to reduce the discharge of pollutants to the maximum extent practicable, as required by Section 402(p)(3)(B) of the CWA, 33 U.S.C. § 1342(p)(3)(B).

WHEREAS, the Unified Government, in 2012, prepared and submitted a SWMP to the EPA and KDHE to address the deficiencies identified in the Unified Government's previous SWMP submittal. KDHE conditionally approved the 2012 SWMP, attached hereto as Appendix

E, pending receipt and review of the Standard Operating Procedures ("SOPs") to implement the SWMP, the final few of which are to be submitted pursuant to Section VI of this Consent Decree.

WHEREAS, this Consent Decree requires the Unified Government to implement its MS4 program in a manner consistent with its MS4 Permit through developing SOPs to implement the SWMP attached hereto as Appendix E, implementing its SWMP and the SOPs identified therein, and updating or revising its SWMP and the SOPs identified therein as may be required in a reissued MS4 Permit.

WHEREAS, the Parties to this Consent Decree have negotiated in good faith and have reached a partial settlement of the issues raised in the Complaint.

WHEREAS, the Unified Government does not admit any liability to the United States or State arising out of the transactions or occurrences alleged in the Complaint.

WHEREAS, the Parties agree, and the Court finds, that partial settlement of the claims alleged in the Complaint without further litigation or trial of any issues is fair, reasonable and in the public interest.

NOW THEREFORE, without the admission by the Unified Government of any of the non-jurisdictional allegations in the Complaint and this Consent Decree, and without adjudication of any fact or law, and with the Consent of the Parties, it is hereby ORDERED, ADJUDGED and DECREED as follows:

I. JURISDICTION AND VENUE

1. This Court has jurisdiction over the subject matter of this action pursuant to 28 U.S.C. §§ 1331, 1345, and 1355; Section 309(b) of the CWA, 33 U.S.C. § 1319(b); and over the

Parties. Venue lies in this District pursuant to Sections 309(b) of the CWA, 33 U.S.C. § 1319(b); and pursuant to 28 U.S.C. § 1391(b) and 28 U.S.C. § 1395(a); because the Unified Government is located in this judicial district and the alleged violations, and a substantial part of the events or omissions giving rise to the claims, occurred in this judicial district. For purposes of this Decree or any action by the United States to enforce this Decree, the Unified Government consents to the Court's jurisdiction over this Decree or such action and over the Unified Government, and consents to venue in this judicial district.

2. The State of Kansas is a party to this Consent Decree, thereby satisfying the notice requirement pursuant to Section 309(b) of the Clean Water Act, 33 U.S.C. § 1319(b), and the requirement of Section 309(e) of the Act, 33 U.S.C. § 1319(e).

II. APPLICABILITY

3. The obligations of this Consent Decree apply to and are binding upon the United States and the Unified Government and any successor or other entities or persons otherwise bound by law.

4. The Unified Government shall provide effective notice to appropriate officers, employees, and agents whose duties include compliance with any provision of this Decree, including, the Mayor, the Unified Government Commission members and any contractor or consultant retained to perform Work required under this Consent Decree that a copy of this Consent Decree is posted on the Unified Government's intranet or internet site. The Unified Government shall be responsible for ensuring that all employees, contractors or consultants involved in performing any work pursuant to this Consent Decree perform such work in a manner consistent with the requirements of this Consent Decree. Any action taken by an entity

retained by the Unified Government to implement the Unified Government's duties under this Consent Decree shall be considered an action of the Unified Government for purposes of determining compliance with this Consent Decree. This Consent Decree shall not limit the Unified Government's rights to take all appropriate action against any such person or entity that causes or contributed to the Unified Government's act or failure to act.

5. Except as provided in Section XIV (Force Majeure), in any action by the United States to enforce this Consent Decree, the Unified Government shall not raise as a defense or excuse for noncompliance the failure by any of its officers, directors, the Unified Government Commission members, employees, agents, or contractors to take any actions necessary to comply with the provisions of this Consent Decree.

6. No transfer of ownership or operation of any of the facilities governed by this Decree, whether in compliance with this Section or otherwise, shall relieve the Unified Government of its obligation to ensure that the terms of the Decree are implemented, unless (a) the transferee agrees to be substituted for the Defendant as a Party under the Decree and thus be bound by the terms thereof and (b) the United States consents to relieve Defendant of its obligations. The decision to refuse or to approve the substitution of the transferee for the Defendant shall not be subject to judicial review. If the Unified Government proposes to sell or transfer part or all of its ownership or operation of any facilities governed by this Decree, it shall advise the purchaser or transferee in writing of the existence of this Consent Decree and provide a copy of the Consent Decree prior to such sale or transfer. The Unified Government shall send a copy of such written notification to the United States pursuant to Section XIX of this Decree (Notices) by certified mail, return receipt requested, at least forty-five (45) days before such sale

or transfer. Any attempt to transfer ownership or operation of any facility governed by this Decree without complying with this Paragraph constitutes a violation of this Decree.

III. OBJECTIVES

7. It is the express purpose of the Parties in entering this Consent Decree that the Unified Government use its best efforts to achieve the goals of: (a) full compliance with its NPDES permits, the CWA, the Kansas public health statutes, and their regulations; (b) compliance with the CSO Policy, including compliance with applicable state water quality standards; (c), the elimination of Sanitary Sewer System Overflows ("SSOs") and Unauthorized CSOs; (d) the elimination of bypasses prohibited by 40 C.F.R. § 122.41(m); and (e) implementation of a SWMP that reduces the discharge of pollutants from the MS4 to the maximum extent practicable and requires implementation of measures to ensure compliance with the Unified Government's MS4 Permit. The Unified Government shall maintain sufficient financial and personnel resources and sufficient equipment and analytical services to administer and implement the Work.

IV. DEFINITIONS

8. Unless otherwise provided in this Decree, terms used in this Consent Decree that are defined in the CWA, or in regulations promulgated pursuant to that Act, shall have the meanings assigned to them in the CWA, or such regulations. Whenever the terms set forth below are used in this Consent Decree, the following definitions shall apply:

"Adequate Capacity" shall mean the ability to collect, convey and treat peak wet weather flows, as identified in the approved IOCP.

"Asset Management" shall mean a structured approach to long-term management of assets as tools for the efficient and effective delivery of services, managing infrastructure capital assets to minimize the total cost of owning and operating them, and improving operational, environmental, and financial performance.

"Bypass" shall mean the intentional diversion of waste streams from any portion of a Wastewater Treatment Facility, as defined in 40 C.F.R. § 122.41(m). The Unified Government may request that an anticipated bypass be approved in accordance with 40 C.F.R. § 122.41(m)(4)(ii).

"Calendar Year" shall mean the twelve (12) month period starting on January 1 and ending on December 31.

"Capacity, Management, Operations, and Maintenance" or "CMOM" shall mean, for the purpose of this Consent Decree, a flexible program of accepted industry practices to properly manage, operate and maintain the Unified Government's entire sanitary wastewater collection, transmission and treatment systems, respond to SSOs, and in conjunction with implementation of the IOCP, investigate and maintain and/or improve the system's capacity.

"Capacity-Related" Sewer System discharge shall mean any unauthorized discharge or release from the City's Separate Sewer System, such as an SSO, Unauthorized CSO or Private Property Backup, that is the result of the inability of that portion of the system or portions of the Separate Sewer System downstream of that portion, to convey or treat flows experienced within that portion of the Separate Sewer System, and where that inability is not primarily maintenance related (e.g., the result of a temporary blockage).

"Certification" or "certify" when used in this Consent Decree shall require the Unified Government to comply with Section XII of this Consent Decree.

"Clean Water Act" or "CWA" or "Act" shall mean the Clean Water Act, formally entitled the Federal Water Pollution Control Act, as amended, 33 U.S.C. § 1251, *et seq*.

"Combined Sewer System" or "CSS" shall mean the portions of the Unified Government's Sewer System which convey sanitary wastewaters (domestic, commercial and industrial wastewaters) and storm water through a single-pipe system to a POTW Treatment Plant (as defined in 40 § CFR 403.3(r)) or an authorized CSO Outfall.

"Combined Sewer Overflow" or "CSO" shall mean any discharge from the CSS at a point prior to the POTW Treatment Plant.

"Combined Sewer Overflow Outfall" or "CSO Outfall" shall mean the outfalls from which CSOs are authorized at the time of the discharge as identified in Appendix D to this Consent Decree, or that may be identified and authorized pursuant to a future issued Kaw Point Permit to discharge to waters of the United States or the State.

"Consent Decree" or "Decree" shall mean this Partial Consent Decree or the Final Consent Decree and all their appendices. In the event of a conflict between this document and any appendices, this document shall control.

"Date of Lodging" shall mean the date on which this Decree is lodged by the United States with the United States District Court for the District of Kansas for a period of public comment.

"Day" or "days" (whether or not capitalized) shall mean a calendar day or calendar days, unless expressly stated otherwise. In computing due dates under this Consent

Decree, where the last day would fall on a Saturday, Sunday, or federal holiday, the period shall run until the close of business – 5:00 pm Central Time – of the next working day.

"Defendants" shall mean the Unified Government of Wyandotte County and Kansas City, Kansas, the State of Kansas, and any successors thereto.

"Design Year" shall mean a theoretical long term median rainfall distribution pattern that shall be used to model the CSS to determine current system performance and the effectiveness of CSO control alternatives. The Design Year shall be developed based on an evaluation of historical rainfall and precipitation event characteristics.

"Deliverable" shall mean any written document or other work product, whether in hard copy or electronic format, required to be prepared and/or submitted by or on behalf of the Unified Government pursuant to this Decree.

"EPA" shall mean the United States Environmental Protection Agency, including any successor departments or agencies of the United States.

"Excessive Infiltration/ Inflow" or "Excessive I/I" shall have the meaning set forth in the definition at 40 C.F.R. § 35.2005(b)(16).

"Force Main" shall mean all Sewer System lines that operate under pressure due to pumping of wastewater at a pump station except for those Sewer System lines that serve a single structure or building.

"Green Infrastructure" shall mean, for purposes of this Consent Decree, the range of stormwater control measures that use plant/soil systems, permeable pavement, or stormwater harvest and reuse, to store, infiltrate, or evapotranspirate stormwater and reduce flows to the

Sewer System. Green Infrastructure may include, but is not limited to, bioretention and extended detention wetland areas as well as green roofs and cisterns.

“Gravity Sewer Line” shall mean a pipe within the Sewer System that receives, contains and conveys wastewater not normally under pressure, but is intended to flow unassisted under the influence of gravity.

“Industrial Facility” shall mean any facility located within the MS4 jurisdictional limits of the Unified Government from which there is a “stormwater discharge associated with industrial activity,” as defined in 40 C.F.R. § 122.26(b)(14)(x).

“Industrial User” shall mean a non-domestic discharger to the Unified Government’s Sewer System, as that term is defined by Section 502(18) of the CWA, 33 U.S.C. § 1362(18), and 40 C.F.R. § 403.3(j).

“I/I” shall mean the total quantity of water from Infiltration and Inflow without distinguishing the source.

“Infiltration” shall mean water other than wastewater that enters the Sewer System, as defined by 40 C.F.R. § 35.2005(b)(20) .

“Inflow” shall mean water other than wastewater that enters the Sewer System, as defined by 40 C.F.R. § 35.2005(b)(21).

“Information Management System” or “IMS” shall mean a system designed and implemented in a manner to efficiently and effectively collect, retain and utilize information and data, including information necessary to implement effective Asset Management, regarding the Unified Government’s MS4, Sewer System and Wastewater Treatment Plants.

"Kansas public health statutes" shall mean the Kansas public health statutes as provided in Kansas Statutes Annotated ("K.S.A.") 65-161 *et seq*., and the regulations promulgated pursuant thereto.

"KDHE" shall mean the Kansas Department of Health and Environment of the State of Kansas, or its successor.

"Level of Service" shall mean a measure to determine the effectiveness of elements of the Sewer System in eliminating SSOs for a rainfall or flow event with a specified recurrence interval.

"Maximum Extent Practicable" shall mean the standard of performance for MS4 programs as described in Section 402(p) of the CWA, and regulations promulgated thereunder at 40 C.F.R. § 122.26.

"MS4" shall mean the Unified Government's municipal separate storm sewer system, as that term is defined in 40 C.F.R. § 122.26(b)(8).

"MS4 Permit" shall mean NPDES Permit No. KS0095656 ("MS4 Permit"), with an effective date of October 1, 2007, and any subsequently issued permit, which authorizes discharges from the Unified Government's MS4 in accordance with conditions specified therein.

"NPDES" shall mean National Pollutant Discharge Elimination System, as established by 33 U.S.C. § 1342.

"NPDES Permit" shall mean the most recently issued NPDES permits issued to the Unified Government for the WWTPs and the MS4 Permit. The current permits as of the Date of Lodging are listed in Appendix A.

"Paragraph" shall mean a portion of this Consent Decree identified by an Arabic numeral.

"Parties" shall mean the parties to this Consent Decree: the United States, the State, and the Unified Government.

"Private Lateral" shall mean that portion of the Sewer System not owned by the Unified Government used to convey wastewater from a building or buildings to that portion of the Sewer System owned by the Unified Government. Private Laterals include connector joints at the Unified Government's sewer line.

"Private Property Backup" shall mean any release of wastewater from the Unified Government's Sewer System to buildings or private property that occurs when a wastewater backup occurs into a building and is caused by blockages, flow conditions, or other conditions in the Sewer System. For purposes of this Consent Decree a wastewater backup that is caused solely by conditions in a Private Lateral is not a Private Property Backup.

"Pumping Station" or "pump station" as used within this Consent Decree shall mean facilities owned or operated by the Unified Government comprised of pumps that lift wastewater to a higher hydraulic elevation or increase the flow rate/volume through the collection system, including all related electrical, mechanical and structural systems necessary to the operation of that pump station. The term Pumping Station shall also apply to facilities referred to as a lift station.

"Sanitary Sewer Overflow" or "SSO" shall mean, for purposes of this Consent Decree, an overflow, spill, diversion, or release of wastewater from or caused by the Unified Government's SSS. This term shall include discharges to the waters of the United States from the City's SSS, as well as any release of wastewater from the City's SSS to public or private property that does not reach waters of the United States, including Private Property Backups. SSOs do not include temporary rerouting of one portion of the SSS or CSS to another portion thereof during collection system repairs.

"Sanitary Sewer System" or "SSS" shall mean the wastewater collection, retention, and transmission systems owned or operated by the Unified Government designed to collect and convey municipal sewage (domestic, commercial and industrial), and not stormwater, to a WWTP.

"Section" shall mean a portion of this Decree identified by an uppercase Roman numeral.

"Sewershed" shall mean a section of the Unified Government's Sewer System that is a distinct drainage or wastewater collection area and designated as such by the Unified Government. For purposes of this Consent Decree, the Sewersheds are identified in Appendix B to this Consent Decree.

"Sewer System" shall mean the municipal sanitary wastewater collection and transmission systems, whether serving CSS or SSS areas, including all pipes, force mains, gravity sewer lines, lift stations, pumping stations, manholes and appurtenances thereto, which are owned or operated by the Unified Government.

"State" shall mean the State of Kansas acting through the Kansas Department of Health and Environment.

"Stormwater Management Program" or "SWMP" shall mean the Unified Government's program to manage municipal stormwater.

"Unauthorized CSO" shall mean for purposes of this Consent Decree, any overflow, spill, diversion, or release of wastewater within the CSS at a location other than an authorized CSO Outfall, as defined herein, that is from or caused by the Unified Government's Sewer System. This term shall include discharges to the waters of the United States from the City's CSS at an unauthorized CSO Outfall, as well as any release of wastewater from the City's CSS to public or private property that does not reach waters of the United States, including Private Property Backups.

"United States" shall mean the United States of America, acting on behalf of EPA.

"Unpermitted Bypass" shall mean any Bypass from a WWTP that constitutes a prohibited bypass as defined in 40 C.F.R. § 122.41(m).

"Wastewater Treatment Plant" or "WWTP" shall mean any devices or systems used in the storage, treatment, and reclamation of municipal wastewater. For the purposes of this Consent Decree, this definition shall include all such facilities owned, managed, operated and/or maintained by the Unified Government, including the facilities for which NPDES permits are identified in Appendix A to this Consent Decree.

"Work" shall mean all activities the Unified Government is required to perform under this Consent Decree.

V. INFORMATION MANAGEMENT SYSTEM

9. No later than September 30, 2013, the Unified Government shall submit to EPA, for review and comment, an Information Management Gap Analysis ("IMGA") and Information Management System ("IMS") Program Plan. The IMGA will include an inventory and

assessment of existing information management elements, and an assessment of the needed components to ensure all necessary information and data related to identification, tracking, operation, maintenance, management, assets and planning for the Unified Government's wastewater and stormwater programs are consistently, efficiently and effectively managed. The IMS Program Plan shall include a framework and schedule for considering and implementing alternatives to address information and asset management gaps identified in the IMGA, as described in Paragraph 10, below. If EPA provides comments on the IMGA and/or IMS Program Plan within thirty (30) days of the Unified Government's submittal, the Unified Government may, within thirty (30) days after receipt of such comments, revise the IMGA and/or IMS Program Plan to address the comments and resubmit it/them to EPA.

10. The IMS shall include the capacity to track significant activities and deadlines pursuant to applicable WWTP and MS4 permits and in plans under this Consent Decree, including but not limited to: the SWMP; the Nine Minimum Control Plan; the Fats, Oils and Grease Control Program Plan; the Collection System Release Response Plan; the Capacity, Maintenance, Operation and Management Program Plan; and the IOCP.

VI. COMPLIANCE MEASURES RELATING TO STORM SEWER SYSTEM

11. SWMP Implementation. Except to the extent certain SOPs are addressed by Paragraph 12, below, the Unified Government shall implement the SWMP, incorporated into the Consent Decree and attached hereto as Appendix E, and the SOPs identified therein immediately upon the Date of Lodging in a manner that meets the requirements of the Unified Government's MS4 Permit. If the Unified Government makes revisions to the SWMP and/or its SOP(s), other than minor corrections or adjustments, the Unified Government shall submit such revised

provisions to the EPA for review, with a copy to the State, in the Annual or Semiannual Report, pursuant to Paragraph 60(b)(v). Such revisions shall not be considered modifications to the Consent Decree for purposes of Section XXII of this Consent Decree (Modification).

12. Standard Operating Procedures. The Unified Government shall provide to EPA, for review and comment, with a copy to the State, the SOPs listed below in Subparagraphs (a) through (c) to implement the SWMP. If EPA, after consultation with the State, provides comments on any such SOP within thirty (30) days of Unified Government's submittal of that SOP, the Unified Government may, within thirty (30) days after receipt of such comments, revise the SOP to address the comments and submit the revised SOP to EPA. The Unified Government shall by no later than March 31, 2013, submit to EPA, with a copy to the State, the following SOPs:

(a) SWMP Section 7.A.1 (Plan Review SOP);

(b) SWMP Section 7.A.2 (Inspection SOP); and

(c) SWMP Section 7.A.3 (Enforcement SOP).

13. Within thirty (30) days following the review and comment process described in Paragraph 12 above, the Unified Government shall implement the procedures in each such SOP in a manner that meets the requirements of the Unified Government's MS4 permit.

14. Legal Authority. By June 30, 2014, and to the extent provided under applicable law, the Unified Government shall certify that it has adopted and will maintain ordinances that:

(a) Confer authority on the Unified Government to perform inspections necessary and appropriate to administer the Illicit Discharge Program, Industrial Stormwater

Management Program, Construction Site Stormwater Management Program, and Post-Construction Stormwater Management Program.

(b) Confer authority on the Unified Government to assess penalties for violation of any Illicit Discharge Program, Industrial Stormwater Management Program, Construction Site Stormwater Management Program, and Post-Construction Stormwater Management Program requirement.

(c) Confer authority on the Unified Government to issue enforceable orders compelling the elimination of any Illicit Connections to its MS4 or the elimination of illicit discharges, and as appropriate, recuperate costs from responsible parties that fail to eliminate discharges within a reasonable time following demand for cessation of discharge.

(d) Confer authority on the Unified Government to issue stop-work orders, where appropriate, compelling the cessation of construction activity at any Active Construction Site (a site requiring construction stormwater permit from KDHE where construction activity is ongoing) and to issue injunctions to prohibit construction activities, when appropriate, until corrections are made at any Inactive Construction Site (a site requiring a construction stormwater permit from KDHE that has not yet reached final stabilization and/or does not meet the requirements to terminate the permit) that is in violation of any of the Unified Government ordinances relating to stormwater management at Active and Inactive Construction Sites.

(e) Confer authority on the Unified Government consistent with 40 C.F.R. § 122.26(d)(2)(iv)(C) to require Industrial Facilities and High-Risk Commercial Facilities, as described therein, and within the area served by the MS4, to address any discharges to the MS4, to install or undertake stormwater control measures on their properties and, if otherwise required by federal or State law, to conduct monitoring and provide the monitoring results to the Unified Government.

(f) Confer authority on the Unified Government to require owners of privately-owned retention and detention basins and other privately-owned stormwater control structures associated with new development or significant redevelopment, within the area served by the MS4, following entry of this Consent Decree to perform necessary maintenance and repairs on such structures and authorize the issuance of schedules for compliance and the assessment of penalties to compel such maintenance and repairs.

15. Funding. Beginning with its first fiscal year after the Effective Date of this Consent Decree, the Unified Government shall ensure there is adequate funding for each operating year in an amount reasonably expected to be sufficient to implement all measures in the SWMP, comply with the MS4 Permit, and comply with all the requirements of this Section of the Consent Decree (Compliance Measures Relating to Storm Sewer System). The Unified Government shall include in the Annual Report for each year, pursuant to Section XII, information regarding its SWMP implementation budget.

16. Personnel and Training. The Unified Government shall maintain adequate personnel and/or retain sufficient contractors to comply with this Section of this Consent Decree. The Unified Government shall, consistent with the provisions of the SWMP, attached hereto as Appendix E, and relevant SOPs, ensure that all personnel with responsibilities for compliance with this Section of this Consent Decree receive necessary and appropriate training to carry out their obligations for MS4 program implementation.

VII. ONGOING CONSTRUCTION AND PROGRAMMATIC ACTIVITIES FOR THE SEWER SYSTEM

A. Construction of Improvements at the Kaw Point WWTP.

17. The Unified Government shall complete the following projects pursuant to the schedules listed below for each project. The Unified Government shall include in each Annual Report, pursuant to Section XII, information regarding its efforts to comply with this Paragraph.

(a) **Design and Construct a 48 Million Gallons Per Day UV Disinfection Facility**. The Unified Government shall design and construct a 48 million gallons per day ("MGD") ultra violet disinfection facility at the Kaw Point WWTP. Construction and start-up shall be completed by September 30, 2015.

(b) **Solids Dewatering Improvements at Kaw Point WWTP.** The Unified Government shall design, construct and begin operations of solids dewatering improvements at the Kaw Point WWTP no later than December 31, 2016, that will produce sludge residuals suitable for landfilling in accordance with 40 C.F.R. Part 503. The Unified Government is constructing the solids dewatering facilities to replace sludge handling after abandonment of the Kaw Point sewage sludge incinerators.

B. Construction of Improvements in the SSS and CSS Service Areas.

18. The Unified Government shall complete the following projects pursuant to the schedules listed below for each project. Unless otherwise indicated herein, the Unified Government shall include in each Annual Report, pursuant to Section XII, information regarding its efforts to comply with each of the projects identified in this Paragraph.

(a) **Investigation and Elimination of Specific CSOs:**

(i) **Closure of CSO 82 and Manhole 064-146 (11th and Troup).** The Unified Government shall conduct an analysis of alternatives for closure of this constructed overflow. The analysis and closure of the overflow shall be completed by Dec. 31, 2013, and reported in the February 15, 2014 Annual Report, pursuant to Section XII.

(ii) **Investigation of CSOs 20, 34-38, 46, 68, and 83.** The Unified Government shall conduct an investigation of CSOs 20, 34-38, 46, 68, and 83, using smoke testing or other means to determine stormwater inputs or connection to the CSS. The Unified Government shall also survey and provide a condition assessment of approximately 130 manholes and a physical survey of the 10 outfalls and diversion structures in the Central Industrial District area. The Unified Government shall submit a report of the investigation in the February 15, 2014 Annual Report, pursuant to Section XII, which shall:

(A) confirm that the CSOs receive stormwater inputs, or if no stormwater input is identified reclassify the CSOs as constructed SSOs; and

(B) evaluate the feasibility of plugging any of the CSOs that were reclassified as constructed SSOs. Where technically feasible and without risk of adverse impacts elsewhere in the system, the Unified Government shall provide a schedule to plug or otherwise eliminate such constructed SSOs by September 30, 2016. If the Unified Government determines that plugging or otherwise eliminating any of the reclassified constructed SSOs is not feasible by September 30, 2016, the Unified Government shall address those SSOs as part of the IOCP.

(b) **North Jersey Creek Sewer System Repairs 12th Street to 18th Street**. The Unified Government shall repair and rehabilitate clay pipe and brick or stone manholes in the area of North Jersey Creek which is generally bounded by N. 12th St. on the East, N. 17th St. on the West, Parallel Ave. on the South and Quindaro Ave. on the North. The scope of the work includes repair and rehabilitation of clay pipe and brick or stone manholes in the combined sewer system. Rehabilitation of pipes will include approximately 9,000 lineal feet of cured in place pipe ("CIPP") lining and spot repair of approximately 25 additional pipe segments. Manhole rehabilitation will include cementitious lining of approximately 1,000 vertical feet of manhole wall and cone and replacement of approximately 50 frames and covers. Implementation of all repairs and rehabilitation work shall be completed no later than December 31, 2013.

(c) **CSO Structure Study and Minor Modifications**. The Unified Government shall conduct an evaluation including a desktop study and field review of all CSO diversion structures to evaluate whether minor structural modifications can be made to enhance system capacity while the IOCP is being developed and implemented. Modifications, such as weir height adjustment, will be constructed if determined to be beneficial and feasible (technically and avoiding adverse impacts elsewhere in the system). The CSO Structure Study, analyzing each diversion structure, shall be submitted as part of the February 15, 2015 Annual Report pursuant to Section XII. The modifications determined beneficial and feasible shall be completed no later than December 31, 2016.

(d) **67th & Parallel - Aerial Sanitary Sewer Line Stabilization.** The Unified Government shall investigate, design and construct stabilization to stream banks as necessary to stabilize and protect the aerial sewer support structures at 67th Street and Parallel Parkway. Construction shall be completed no later than March 30, 2014.

(e) **SSS Pump Station Repair and Rehabilitation Evaluation.** The Unified Government shall evaluate all pump stations in the SSS to identify the physical condition of each Pumping Station, including individual pump capacity, station firm capacity and stand-by power, to determine their condition, reliability and capacity. The evaluation will provide the basis for prioritizing repair and rehabilitation activities including integration with IOCP planning and implementation. The goal of the repair and rehabilitation work is to improve pump station condition and reliability and thereby reduce the potential for mechanical and/or electrical failure-related sewer overflows. The evaluation for the first 34 pump stations within the SSS will be completed according to the criteria set forth in Subparagraph (i) below, and compiled into a summary report and schedule for repair to be submitted to EPA, with a copy to the State, no later than June 30, 2013. The remaining 30 pump stations in the SSS will be evaluated according to the criteria set forth in Subparagraph (i) below, and compiled into a summary report and schedule for repair to be submitted to EPA, with a copy to the State, no later than June 30, 2014. The Unified Government shall commit to spending at least $700,000 on an annual average basis for five years from the date of entry of the Consent Decree to implement the highest priority pump station repairs identified in the evaluation. The Unified Government shall include in each Annual Report submitted pursuant to Paragraph 60(c)(ii), a list and brief description of all pump station repairs implemented pursuant to this Paragraph during the reporting year and the costs associated with those repairs. Any additional pump station repairs identified in the evaluation that are not completed pursuant to the above shall be addressed in the approved IOCP and/or scheduled for completion as part of Capacity, Management, Operations, and Maintenance Program Plan implementation, as addressed by Subsection G, below.

(i) The Pump Station evaluation criteria shall include, but not be limited to criteria for when a pump station must be repaired or rehabilitated, identification of firm pump capacity, provisions for alternate power, general physical condition, and existing/planned supervisory control and data acquisition ("SCADA"). For pump stations of 1,000 gallons per minute ("gpm") firm capacity or more, the evaluation shall also include field-development of the pumping system head curves.

(f) **Stream Crossing Inspection.** The Unified Government shall conduct a field inspection to locate exposed pipelines and immediately adjacent structures that are at risk due to stream bank erosion. Findings of the inspection will be used for planning and budgeting for future corrective action. The inspection shall be completed and the results compiled into a summary report, including a preliminary schedule for repairs, submitted to EPA, with a copy to the State, no later than December 31, 2013. The preliminary schedule will be finalized through the subsequent Unified Government budgeting and planning process. The Unified Government shall correct all defects and/or make repairs identified by the inspection by September 30, 2016 or include the project in the IOCP. The Unified Government shall include in each Annual Report, pursuant to Section XII, information regarding activities to comply with this Paragraph.

(g) **Brush Creek Service Area**. The Unified Government shall make interim repairs or replace Pump Station 37 to enhance its capacity and reliability and reduce potential overflows until such time as the remedial measures for Brush Creek Service Area identified in the IOCP are implemented. Repairs or replacement of Pump Station 37 shall be completed by

December 31, 2014. The Unified Government will confirm completion of the repairs or replacement of Pump Station 37 in the February 15, 2015, Annual Report, pursuant to Section XII.

C. Fats, Oil and Grease Control Program Plan

19. The Unified Government shall implement the Fats, Oil and Grease ("FOG") Control Program Plan, incorporated into the Consent Decree and attached hereto as Appendix F, to reduce the potential for grease accumulations which may impact Sewer System capacity and contribute to Sewer System Overflows. The FOG Control Program Plan includes an implementation schedule for the various aspects of the Plan.

20. No later than July 1, 2014, the Unified Government shall report and certify to EPA, in accordance with Section XII, that it has adopted appropriate legal authority to administer its FOG Control Program, attached to this Consent Decree as Appendix F, and that the FOG Control Program Plan is being fully implemented in accordance with the schedule, therein.

21. The Unified Government shall periodically review and update the FOG Control Program Plan and the associated SOPs, as necessary, to ensure effective and efficient implementation of the FOG Control Program. If the Unified Government makes revisions to the FOG Control Program Plan and/or its SOP(s), other than minor corrections or adjustments, the Unified Government shall submit such revised provisions to the EPA for review, with a copy to the State. Such revisions shall not be considered modifications to the Consent Decree for purposes of Section XXII of this Consent Decree (Modification).

22. The Unified Government shall include in the Annual Report each year, pursuant to Section XII, information regarding implementation of the FOG Program Plan.

D. Collection System Release Response Plan

23. The Unified Government shall implement the Collection System Release Response Plan ("CSRRP") incorporated into the Consent Decree and attached hereto as Appendix G.

24. The Unified Government shall periodically review and update the CSRRP and the incorporated SOPs, as necessary, to ensure effective and efficient implementation of the CSRRP. If the Unified Government makes revisions to the CSRRP and/or its SOP(s), other than minor corrections or adjustments, the Unified Government shall submit such revised provisions to the EPA for review, with a copy to the State, in the Annual or Semiannual Report, pursuant to Paragraph 60(b)(v). Such revisions shall not be considered modifications to the Consent Decree for purposes of Section XXII of this Consent Decree (Modification).

E. Abandonment of Sewer Services Program and New Sewer Construction

25. The Unified Government shall evaluate its legal authority regarding abandonment of sanitary sewer services to assess whether it is sufficient to effectively reduce ongoing excessive I/I following abandonment of sewer services. If determined appropriate based on the above evaluation, the Unified Government shall revise its legal authority. The evaluation shall focus on ensuring that the lateral sewer lines will be plugged at the connection point to the Unified Government-owned main, where feasible. The Unified Government shall provide a copy of the ordinance or other legal authority and any recommended changes thereto, together with a schedule for adopting such changes, to EPA in the 2014 Annual Report.

26. The Unified Government shall enforce its Sewer Ordinance (Ord. No. O-46-05, § 1, 6-2-2005; Sewer Use Ordinance Chapter 30, Article V, Section 30-122) as to new

construction in order to prohibit discharges of stormwater, surface waters, ground waters, roof runoff, cooling water, and Excessive I/I to the Sewer System.

F. Nine Minimum Controls Plan for the Combined Sewer System

27. The Unified Government shall implement the Nine Minimum Controls Plan ("NMCP") incorporated into the Consent Decree and attached hereto as Appendix H.

28. The Unified Government shall periodically review and update the NMCP, as necessary, to ensure effective and efficient implementation of the NMCP. If the Unified Government makes revisions to the NMCP, other than minor corrections or adjustments, the Unified Government shall submit such revised provisions to the EPA for review, with a copy to the State, in the Annual or Semiannual Report, pursuant to Paragraph 60(b)(v). Such revisions shall not be considered modifications to the Consent Decree for purposes of Section XXII of this Consent Decree (Modification).

G. Capacity, Management, Operations, and Maintenance Program Plan

29. The Unified Government shall submit by December 31, 2013, for review and approval by EPA in accordance with the requirements of Section XII, with a copy to the State, a comprehensive Capacity, Management, Operations, and Maintenance ("CMOM") Program Plan with a proposed implementation schedule. The CMOM Program Plan and other submittals shall be based on good engineering practices and in accordance with accepted industry standards, using the following documents as guidance, as applicable: (a) EPA's Handbook: Sewer System Infrastructure Analysis and Rehabilitation, EPA/625/6-91/030, 1991 (hereafter "EPA Handbook"); (b) National Association of Sewer Service Companies Sewerage Rehabilitation Manual; and (c) Water Environment Federation Manual of Practice FD-6 – Existing Sewer

Evaluation and Rehabilitation, Third Edition. The CMOM Program Plan shall incorporate the following elements: statement of program goal; establishment of performance goals; organizational structure and communication; legal authority; training; maintenance activities for gravity sewers, interceptors, public laterals, pump stations and force mains; and design construction and testing standards for new and rehabilitated gravity sewers, force mains and manholes. Until such time as the CMOM Program Plan may be modified to conform to the approved IOCP, the CMOM Program Plan shall establish maintenance, inspection, and rehabilitation/replacement levels in a manner designed to maintain the existing level of wet weather capacity service. The CMOM Program Plan shall describe:

(a) Standard procedures for documentation of:

(i) Customer complaints and response thereto;

(ii) Work order tracking and management; and

(iii) Updates to sewer system inventory and mapping.

(b) Preventive and routine maintenance procedures for cleaning and closed-circuit television ("CCTV") inspection of gravity lines.

(c) Routine inspection and maintenance procedures for pump stations, including standard procedures for inspections and maintenance.

(d) Routine inspection and maintenance procedures for force mains, including standard procedures for assessment and maintenance.

(e) Integration of the Unified Government's ongoing operation, maintenance and response programs, including but not limited to the FOG Control Program, the CSRRP and a root control program.

30. The CMOM Program Plan shall include a section on a capacity assurance plan that will be implemented to maintain capacity following the correction of capacity issues identified and rectified as a result of implementation of the IOCP. The CMOM Program Plan shall also include a section on capacity evaluation for future changes to the Sewer System relating to continued system aging (e.g., increasing I/I) and system growth not envisioned or considered in the IOCP.

31. Until such time as the CMOM Program may be modified to conform to the approved IOCP, the Unified Government shall implement the CMOM Program in a manner designed to maintain the existing level of wet weather capacity service. The Unified Government shall:

(a) Inspect Gravity Sewer Lines:

(i) The Unified Government shall:

(A) conduct an internal inspection of (1) each section of Gravity Sewer pipe that experiences a non-capacity related SSO, and (2) as appropriate, conduct any upstream and/or downstream sections, using CCTV or other appropriate inspection methods (excluding lamping) as soon as is practicable following the resolution of the non-capacity related SSO but not longer than 30 days after the non-capacity related SSO was resolved; and

(B) perform an appropriate inspection no more than 90 days following any permanent repair, rehabilitation, and/or replacement of sewer pipes;

(ii) In addition to the incident-based inspections addressed by Subparagraph (i) above, the Unified Government shall CCTV at least 40 miles of sewer pipe per year, of which at least 28 miles shall be unique. CCTV general priority shall be based on pipe age, pipe material, and maintenance history and shall include sewers that have experienced non-capacity related SSOs, blockages and/or structural failures. Subject to the requirement that at least 28 unique miles of pipe televised are unique, the Unified Government may include pipe segments that are televised more than one time in the total annual miles of pipe that are televised; and

(iii) The Unified Government shall maintain a data retrieval storage system that allows access to inspection reports and video of sewer pipes.

(b) Clean Gravity Sewer Lines:

(i) The Unified Government shall clean 200 miles of its gravity sewer lines within its collection system annually, of which at least 140 miles shall be unique;

(ii) The Unified Government shall maintain retrievable data records to indicate the location and lengths of gravity sewer cleaned and describing the techniques used to clean each sewer segment. The acquired data shall be used to inform the need for additional CCTV inspections and increased cleaning cycles.

(c) Inspect, repair, rehabilitate, and replace certain Sewer System manholes:

(i) The Unified Government shall inspect no less than 1,000 manholes annually. Inspection shall include the evaluation of manhole frame-to-adjustment ring-to-manhole-barrel seals in its Sanitary Sewer System; and

(ii) The Unified Government shall repair, rehabilitate, and/or replace at least 250 manholes per year on a 3-year rolling annual average.

(d) Rehabilitate, repair and/or replace certain sewer pipes:

(i) The Unified Government shall budget for and permanently repair, rehabilitate, and/or replace sewer pipe in the Sewer System annually based on current CCTV records, pipe age, and material and maintenance history;

(ii) The Unified Government shall repair known defects (i.e., those defects that have caused or increase the risk of a non-capacity related SSO, including conditions leading to structural collapse or that would create blockages) as soon as is practical. The Unified Government shall maintain a log listing discovered sewer line defects in need of expeditious repair or replacement, the date the Unified Government discovered the defect, and the date of project completion.

(e) Implement a routine and preventative maintenance program for Pump Stations:

(i) The Unified Government shall conduct visual inspections no less than monthly for all Pump Stations, no less than twice per month for pump stations between 1 MGD to 5 MGD in peak hydraulic capacity, and no less than weekly for pump stations greater than 5 MGD in peak hydraulic capacity; and

(ii) The Unified Government shall use SCADA to continuously monitor station performance at stations so equipped. The remaining pump stations shall be monitored through dialer alarm systems reporting high wet wells, power failure, pump failures and phase loss.

(f) Implement a corrective and emergency Pump Station response program as identified in the CSRRP:

(i) The Unified Government shall create and maintain a list of backup portable pumping equipment and portable generators available for Pump Stations that rely on redundant storage only to prevent overflows during periods of pumping equipment malfunction or primary power outage.

(g) Inspect and repair of Force Mains:

(i) The Unified Government shall develop and implement an SOP for inspection and repair of Force Mains, incorporating the following:

(A) if warranted, evaluation of nondestructive inspection techniques;

(B) inspection of air and vacuum release valves ("ARVs");

(C) inspection of force main discharge points for evidence of corrosion; and

(D) periodic review of force main age, construction material and maintenance history; and

(ii) The Unified Government shall repair all defects within one (1) year of discovery, unless impracticable. If unable to complete a repair of such a defect within one year of discovery, the Unified Government will submit a schedule for repair of the defect.

32. CMOM Program Plan Implementation: The Unified Government shall implement the approved CMOM Program Plan in accordance with the schedule provided in Paragraph 29. After approval of the CMOM Program Plan as described in Paragraph 29, the Unified Government shall annually review its CMOM Program Plan and update the program as necessary to ensure that the program is achieving the service levels contained in the approved

IOCP Plan. If the Unified Government makes revisions to the approved CMOM Program Plan, other than minor corrections or adjustments, the Unified Government shall submit such revised provisions to the EPA for review, with a copy to the State, in the Annual or Semiannual Report, pursuant to Paragraph 60(b)(v). Such revisions shall not be considered modifications to the Consent Decree for purposes of Section XXII of this Consent Decree (Modification).

33. Until approval of the IOCP, the Unified Government shall submit the following as part of its Annual Report, pursuant to Paragraph 60(c):

(a) The number of miles of unique and repeat gravity sewer pipe inspected by CCTV during the preceding calendar year as separate totals. If the Unified Government has not achieved the required mileage of CCTV during the reporting year, the Annual Report shall identify and discuss the reasons why the mileage requirement was not achieved;

(b) The number of miles of gravity sewer pipe cleaned during the preceding calendar year. If the Unified Government has not achieved the required mileage of cleaning during the reporting year, the Annual Report shall identify and discuss the reasons why the mileage requirement was not met;

(c) The number of manholes, by category, e.g., combined, separate, storm, that were inspected, repaired, rehabilitated and/or replaced during the preceding calendar year. If the Unified Government has not achieved the required number of manholes inspected, repaired, rehabilitated and/or replaced during the reporting year, the Annual Report shall identify and discuss the reasons why the requirement was not met;

(d) The location and lengths of sewer pipe repaired, rehabilitated, and/or replaced during the preceding calendar year;

(e) The number of Pump Stations inspected or otherwise assessed during the preceding calendar year and a brief description of any completed or scheduled repairs; and

(f) The location and lengths of Force Mains assessed during the preceding calendar year, a brief description of the findings of the assessment and any completed or scheduled repairs.

H. Certification of Legal Authority

34. The Unified Government hereby certifies that as to the Sewer System, to the extent allowable by applicable law, it has sufficient legal authority to:

(a) control I/I from private and public sources;

(b) require that sewers and connections be properly designed and constructed;

(c) ensure there is proper installation, testing and inspection of new and rehabilitated sewers;

(d) implement the general and specific prohibitions of the Pretreatment Program as defined in 40 C.F.R. § 403.5 and to implement its approved Pretreatment Program;

(e) prohibit Inflow to the SSS and provide mechanisms for requiring its removal as warranted; and

(f) control the introduction of fats, oil, and grease from commercial institutions and establishments.

35. The legal authority may be in the form of sewer use ordinances, service agreements, contracts or other legally binding mechanisms.

VIII. EVALUATION OF SEWERSHEDS WITHIN THE UNIFIED GOVERNMENT'S SEWER SYSTEM

36. The Unified Government's Sewer System consists of CSS and SSS as depicted on the map attached hereto as Appendix B. The Unified Government shall implement the requirements of this Section for the Sewer System in accordance with any deadlines set forth below and in Section IX.

A. Sewer System Evaluation Work Plan

37. By no later than March 15, 2013, the Unified Government shall submit for review and approval by EPA in accordance with Section XII, with a copy to the State, a Sewer System Evaluation Work Plan ("SSE Work Plan") for completing the evaluations, analysis, modeling, alternatives development, and public participation as identified in Subsections B through F, below: Subsections B and C address the characterization, evaluation and development of the alternatives for addressing overflows in the SSS; Subsections D and E address the characterization, evaluation and development of alternatives for addressing overflows in the CSS; and Section F addresses public and stakeholder involvement. The SSE Work Plan shall include a detailed description of work to be performed and shall serve as the framework for the development of the IOCP. Upon approval by EPA, the Unified Government shall implement the SSE Work Plan. The Unified Government shall include in each Annual and Semiannual Report, pursuant to Section XII, information regarding implementation of the approved SSE Work Plan.

B. Sanitary Sewer System Characterization

38. The Unified Government shall complete a characterization of its SSS ("SSS Characterization") in accordance with the requirements of this Subsection and Subsection C, below. The Unified Government shall summarize the actions taken to complete the SSS

Characterization activities in the Annual Report required under Section XII for the twelve-month period in which the requirements were completed. The results of the SSS Characterization shall be reported in the SSS Characterization Report and submitted to EPA for review and comment no later than August 31, 2015, with a copy to the State. If EPA provides comments on the SSS Characterization Report within forty-five (45) days of the Unified Government's submittal, the Unified Government may, within thirty (30) days after receipt of such comments, revise the SSS Characterization Report to address the comments and resubmit it/them to EPA, with a copy to the State. The final SSS Characterization Report shall be submitted with the IOCP.

39. The SSS Characterization shall be used to develop the remedial measures in the IOCP required pursuant to Section IX, and shall be carried out with consideration of the guidance provided in the appropriate sections of the *Handbook: Sewer System Infrastructure Analysis and Rehabilitation*, EPA/625/6-91/030, 1991; *Existing Sewer Evaluation and Rehabilitation,* WEF MOP FD-6, 2009; the National Association of Sewer Service Companies ("NASSCO") "Manual of Practice;" and sound engineering practice. The SSS Characterization shall:

(a) identify Sewersheds with Excessive I/I that may be causing and/or contributing to capacity-related SSOs (including Private Property Backups) and/or Bypasses at the WWTPs;

(b) identify and quantify, through flow monitoring, modeling, or analyses SSOs within each Sewershed and the volumes associated with each SSO;

(c) identify areas subject to chronic capacity-related Private Property Backups;

(d) identify typical sources of I/I within the SSS Sewersheds;

(e) identify the design constraints of Force Mains and Pumping Stations, including failure of individual pumps, lack of redundant pumps, and lack of alternative power sources that contribute to SSOs, including Private Property Backups:

(f) identify and quantify sources of I/I within demonstration areas determined to have Excessive I/I rates;

(g) identify cross connections between the SSS and sources, such as water supply lines or storm sewers, and unauthorized connections to the SSS within demonstration areas where SSES investigations are performed; and

(h) identify physical degradation of the SSS that causes or contributes to SSOs (including Private Property Backups) within demonstration areas where SSES investigations are performed.

40. The SSS Characterization shall include, at a minimum, the following elements:

(a) Review of existing data concerning SSOs, sewage flows, WWTPs and SSS attributes (i.e., pipe diameters, pipe segment lengths, catchment characteristics, invert elevations), and an evaluation of the accuracy, completeness and adequacy of that data for purposes of supporting the characterization of the SSS. The data review will further identify any additional data needed to satisfy the requirements identified in Paragraph 37 and the Unified Government shall obtain the additional data to complete the SSS Characterization.

(b) Acquisition of asset data and preparation of a SSS inventory for those sewers to be included in the hydraulic model of the SSS, as shown in Appendix C, including, at a minimum, all gravity interceptor sewers 15- inches and larger; all other sewers to points at least 1000 feet upstream of known recurring SSOs; emergency overflows; and, force mains serving major pumping stations (capacity of 1000 gpm minimum or greater) in the SSS. Surveys and field investigations for asset data acquisition shall be performed using GPS or other appropriate technology to obtain missing or incomplete asset data.

(c) Completion of an inventory of existing SSS pumping station data for use in the hydraulic modeling. Data defining the installed pumping units, wet well dimensions, and pump operating control settings shall be obtained. As a minimum, pumping unit data shall include field-developed pumping system head curves for all pump stations having firm capacities of 1000 gpm or greater.

(d) Determination of WWTP hydraulic capacities of the major process units in the treatment train performed by in-plant stress-testing, by calculation, review of historical performance records, or by hydraulic modeling.

(e) Dry and wet weather flow monitoring with concurrent rainfall monitoring beginning no later than March 1, 2013, as needed to reasonably characterize flows in the system and provide adequate data for development of computer models. Dry weather monitoring shall be carried out so as to allow the characterization of sanitary wastewater flow rates, baseline groundwater infiltration rates, and diurnal flow patterns. Wet-weather monitoring shall be carried out so as to allow the characterization of rainfall-induced infiltration and stormwater inflow rates. Monitoring site selection, equipment selection, equipment installation, calibration, maintenance, and data quality assurance checks shall generally conform to the recommendations presented in the *Code Of Practice For The Hydraulic Modeling Of Sewer Systems Version 3.001,* December 2002 by The Chartered Institution of Water and Environmental Management (CIWEM, formerly WaPUG).

(f) Analyses of flow monitoring data to estimate I/I that enters the collection system.

(g) Identification of high priority Sewersheds. High priority Sewersheds will be those with constructed SSOs, capacity restrictions, recurring wet-weather SSOs, and/or high I/I rates.

(h) Based on the analysis of the flow monitoring conducted in (e) of this Paragraph, the Unified Government shall select a minimum of three demonstration areas located in high priority Sewersheds. Demonstration areas shall be subject to field investigation for the purpose of identifying and quantifying sources of I/I and establishing rehabilitative procedures for reduction of I/I. Detailed field investigation may include, but not be limited to:

(i) Flow monitoring;

(ii) Manhole Inspections;

(iii) Smoke Testing;

(iv) Building Inspections;

(v) Dye Testing;

(vi) CCTV Inspections; and

(vii) Data processing and analysis of inspection data to identify and categorize system defects and I/I sources.

(i) I/I reduction demonstration projects within high priority Sewersheds shall be performed to gather information specific to the Unified Government's SSS and to the application of various rehabilitation techniques for guidance of future, system-wide I/I reduction. Temporary flow monitoring shall be performed downstream from the I/I reduction demonstration projects prior to commencing rehabilitation projects (pre-construction flow monitoring) and following completion of rehabilitation (post-construction monitoring). Assessment of the flow data from those monitors will include comparing the system's rainfall response to the data collected during the original flow monitoring performed under (e) in this Paragraph, and determining the effectiveness of the demonstration project to reduce I/I and SSOs. The Unified Government will utilize data developed in the I/I reduction demonstration projects along with performance data demonstrated by other communities and other published literature to forecast planning level probable rates of I/I reduction to be utilized in the development of the IOCP. Additional detailed SSE work may be required during the detailed design phase of remedial projects when implementing the IOCP.

(j) Development of a dynamic computerized SSS Hydraulic Model for the assessment of the hydraulic capacity of the SSS, as identified in Appendix C. Identification of the causes of capacity-related SSOs, and the identification of appropriate remedial measures to address capacity limitations identified for a level of service range to be defined in the SSE Work Plan submitted under Paragraph 37 above. The SSS Hydraulic Model shall be capable of providing an understanding of the response of the SSS to wet weather events and an evaluation of the impacts of proposed remedial measures and reduction of I/I flows. The model shall include, at a minimum, all gravity interceptor sewers 15- inches and larger; all other sewers to points at least 1000 feet upstream of known recurring SSOs; and force mains serving major pumping stations (capacity of 1000 gpm minimum) in the SSS. The model shall be developed and calibrated in accordance with the recommendations presented in the *Code Of Practice For The Hydraulic Modeling Of Sewer Systems Version 3.001*, December 2002 by The Chartered Institution of Water and Environmental Management (CIWEM, formerly WaPUG).

(k) The SSS Hydraulic Model, as depicted in Appendix C, shall be applied for performance of a capacity assessment of the SSS to allow a technically sound evaluation of the causes of capacity-related SSOs and overloading or bypasses at the WWTPs for the defined level of service range. In Sewersheds that are not depicted in Appendix C, desk-top capacity analyses (without modeling) of gravity lines, pumping stations, and force mains for existing and future conditions shall be performed.

C. SSO Control Alternatives Development and Evaluation

41. The Unified Government shall develop and evaluate alternatives that include specific measures that, if implemented, will result in Adequate Capacity in the SSS and/or at the WWTPs, as identified in the approved IOCP, with the goal of eliminating capacity-related SSOs, Unpermitted Bypasses, and wet weather related NPDES permit noncompliance. Alternatives development and evaluation shall include:

(a) Identification of WWTP upgrades and repair measures necessary to achieve WWTP compliance with NPDES permit limitations and requirements to eliminate Bypasses, except as may be specifically authorized pursuant to 40 C.F.R. § 122.41(m).

(b) Assessment of potential SSO reduction technologies appropriate for each Sewershed considering unique Sewershed-specific features. Specific technologies to address capacity limitations may include, but are not limited to, I/I reduction or removal, increases in pumping station and sewer capacity in the SSS, construction of storage or equalization basin facilities, or increases in wastewater treatment capacity.

(c) Evaluation of I/I removal and reduction to determine the appropriate I/I removal level versus providing additional transport and/or treatment capacity in each Sewershed. Anticipated I/I removal rates shall reflect current industry practice, local experience, and if available, the results obtained from I/I reduction demonstration projects.

(d) Development of recommended SSO control alternatives in each Sewershed that provide Adequate Capacity in the SSS based upon a range of service levels considering the technologies that were screened in (b) above. The following tasks shall be conducted to develop recommended SSO control alternatives:

(i) Evaluation of the expected performance of the specific technology, or combination of technologies to address capacity limitations;

(ii) Application of the SSS Hydraulic Model for each alternative under evaluation. The SSS Hydraulic Model shall be utilized to estimate the sizes of the improvement alternatives;

(iii) Cost evaluations will be performed to help guide selection of alternatives. The Unified Government will consider implementation costs versus the performance for each control alternative;

(iv) Evaluation of the location of control facilities by considering factors such as the availability of sufficient space for the proposed facility as well as environmental, political, or institutional issues; and

(v) Consideration of Green Infrastructure alternatives, as described in Section X.

D. CSS Characterization

42. The Unified Government shall conduct a characterization of the CSS ("CSS Characterization") in accordance with the requirements of this Subsection and Subsection E, below. The Unified Government shall summarize the actions taken to complete the CSS Characterization activities in the Annual Report required under Section XII for the twelve-month period in which the requirements were completed. The results of the CSS Characterization shall be reported in the CSS Characterization Report and submitted to EPA for review and comment no later than May 31, 2015, with a copy to the State. If EPA provides comments on the CSS Characterization Report within forty-five (45) days of the Unified Government's submittal, the Unified Government may, within thirty (30) days after receipt of such comments, revise the CSS Characterization Report to address the comments and resubmit it/them to EPA, with a copy to the State. The final CSS Characterization Report shall be submitted with the IOCP.

43. The CSS Characterization shall be carried out in accordance with the federal Combined Sewer Overflow Control Policy, 59 Fed. Reg. 18688 (April 19, 1994) (CSO Policy), and shall include:

(a) A review of existing data concerning CSOs, sewage flows, WWTPs and CSS attributes (i.e., diversion structures, outfalls, pipe diameters, pipe segment lengths, drainage areas, catchment characteristics, invert elevations), and an evaluation of the accuracy, completeness and adequacy of that data for purposes of supporting the characterization of the CSS.

(b) Acquisition of asset data and preparation of a CSS inventory for sewers to be included in the hydraulic model of the CSS, as shown in Appendix C, including, at a minimum, all gravity interceptor sewers 15- inches and larger; all other sewers to points at least 1000 feet upstream of all diversion structures; all dry weather outlet sewers from diversion structures to the receiving WWTP; and all wet weather overflow lines from diversion structures to outfalls and force mains serving major pumping stations (capacity of 1000 gpm minimum) in the CSS. Surveys and field investigations shall be performed using GPS or other appropriate technology to obtain missing or incomplete asset data.

(c) Completion of an inventory of existing CSS pumping station data for use in hydraulic modeling. Data defining the installed pumping units, wet well dimensions, and pump operating control settings shall be obtained. As a minimum, pumping unit data shall include field-developed pumping system head curves for all pump stations having firm capacities of 1000 gpm or larger.

(d) Determination of the Kaw Point WWTP hydraulic capacity of the major process units in the treatment train through the performance of one or more of the following, as appropriate: in-plant stress-testing, calculation, review of historical operating data, and/or hydraulic modeling.

(e) Evaluation of precipitation data to define typical rainfall distribution patterns and recurrence intervals. Project and historical data will be used to develop design events and a Design Year that will be applied when modeling existing conditions and alternative control scenarios.

(f) Dry and wet weather flow monitoring with concurrent rainfall monitoring beginning no later than March 1, 2013, to reasonably characterize flows in the system and provide adequate data for the calibration and verification of models that simulate the frequency, magnitude, and duration of CSOs. Dry weather monitoring shall be carried out so as to allow the characterization of sanitary wastewater flows, baseline groundwater infiltration rates and diurnal flow patterns. Wet weather monitoring shall be carried out so as to allow the characterization of the hydraulic response of the CSS to rainfall events. Monitoring site selection, equipment selection and installation, calibration, maintenance, and data quality assurance checks shall generally conform to the recommendations presented in the *Code Of Practice For The Hydraulic Modeling Of Sewer Systems Version 3.001,* December 2002 by The Chartered Institution of Water and Environmental Management (CIWEM, formerly WaPUG).

(g) Development of a dynamic computerized CSS Hydraulic Model for understanding of system hydraulic response to rain events, identification of the causes of Unauthorized CSOs, and for the identification of appropriate remedial measures to address capacity limitations during design events and the Design Year. The model shall include those CSS elements identified in Appendix C including, sewers 15- inches and larger; all other sewers to points at least 1000 feet upstream of all diversion structures; all dry weather outlet sewers from diversion structures to the receiving WWTP; all wet weather overflow lines from diversion structures to outfalls; flow contributions from SSS connections; and force mains serving major pumping stations (capacity greater than 1000 gpm) in the CSS. The CSS Hydraulic Model shall be developed and calibrated in accordance with the recommendations presented in the *Code Of Practice For The Hydraulic Modeling Of Sewer Systems Version 3.001,* December 2002 by The Chartered Institution of Water and Environmental Management (CIWEM, formerly WaPUG).

(h) The CSS Hydraulic Model will then be applied to evaluate alternative control scenarios and will be used to:

(i) Simulate CSO occurrence, duration, and volume for rain events other than those that occurred during the flow monitoring period;

(ii) Simulate the hydraulic response of portions of the CSS that have not been monitored;

(iii) Simulate the effect of sanitary sewer system connections to the combined sewer system; and

(iv) Develop CSO statistics such as the number of CSO activations and percent of combined sewage captured and treated in a Design Year.

(i) Water Quality Characterization. The objective of the water quality characterization is to assess the impacts of CSO and non-CSO sources on receiving streams. Work to be performed shall include:

(i) Compilation and analysis of existing water quality and receiving stream data: This task will include compiling and assessing relevant information and data to meet the following objectives:

(A) Identify receiving streams and applicable water quality standards; 303(d) impairments and TMDLs for receiving streams; and available water quality data for CSO discharges and receiving streams;

(B) Identify water quality parameters of concern;

(C) Identify sensitive areas; and

(D) Identify data gaps.

(ii) Water quality monitoring: This task will include designing and implementing a water quality monitoring program to address data gaps related to water quality characterization of CSO and non-CSO sources and receiving streams and support the development and calibration of receiving stream models.

(iii) Receiving stream modeling: This task will include selection, development, calibration, validation, and application of water quality models to characterize the existing impact of CSO and non-CSO sources on receiving streams, assess water quality benefits under various control scenarios, and assess attainment with water quality standards.

E. CSO Control Alternatives Development and Evaluation

44. The Unified Government shall consider the range of alternatives specified in the CSO Policy and associated Long Term Control Plan Guidance, including Green Infrastructure storm water infrastructure or BMPs, and varying levels of control within those alternatives, using expected benefits and cost-effectiveness to help guide the evaluation of controls. A series of tasks shall be performed to screen options and determine the most likely approaches for CSO reduction in CSS Sewersheds. Alternatives development and evaluation shall include:

(a) Maximization of Treatment at the Kaw Point WWTP. Proper evaluation of "convey and treat" or "store and treat" alternatives shall require evaluating the capacity of the Kaw Point WWTP to receive and treat wet weather flows. Plant analysis shall include review of methods to maximize treatment during wet weather. Evaluations will assess treatment efficiency impacts due to increased hydraulic loading, rate of increase in loading, and first flush loading.

(b) Performance of a preliminary CSO technology applicability assessment for each CSS Sewershed considering unique Sewershed-specific features such as diversion structures/outfalls, receiving waters, land uses, and public input. Technologies that shall be considered are generally grouped as described in the EPA document entitled "Combined Sewer Overflows - Guidance for Long-Term Control Plan." Consideration shall also be given to Green Infrastructure alternatives.

(c) Development of recommended CSO control alternatives considering the technologies that were screened in (b) above. The following tasks shall be conducted to develop recommended control alternatives:

(i) Assurance that control alternatives are consistent with the regulatory requirements of the Nine Minimum Controls;

(ii) Evaluation of the expected performance of the technology, or combination of technologies, which make up the alternative under consideration. Performance evaluation in each Sewershed will consider eliminating individual overflow locations; relocating (when appropriate and possible) overflow locations; reducing overflow frequency and/or volume; and partial treatment and discharge (when appropriate). Elimination and reduction evaluations will include sewer separation (partial or total, whichever is appropriate) and combinations of storage and transport for treatment alternatives. Relocation evaluations will include diversion structure and outfall consolidation (where appropriate) and relocation of outfalls to locations where impacts will not be as significant on receiving waters. Green Infrastructure technologies or BMPs will be evaluated for reducing overflow volumes and frequency and replacement of storage alternatives where determined to be feasible through the assessment performed pursuant to Subparagraph (b) of this Paragraph.

(iii) Application of the CSS Hydraulic Model for each alternative under evaluation. The CSS Hydraulic Model shall be utilized to estimate improvement sizes necessary to achieve ranges of percent wet weather capture as well as an average number of overflow events in the Design Year consistent with the CSO policy. The CSS Hydraulic Model outputs from the most promising alternatives shall also be input to the water quality model to assess resulting receiving waters quality impacts.

(iv) Perform cost evaluations to help guide selection of controls. These evaluations shall consider a range of controls at different costs of implementation. Modeling results, both CSS and water quality, generated during the performance evaluations, shall be utilized when assessing the benefits to be attained by each control alternative. Implementation costs for each control alternative shall be developed and performance versus cost comparisons shall then be made for the range of alternatives considered.

(v) Performance of preliminary siting considerations evaluations considering availability of sufficient space for the proposed facility, distance of the site from CSO diversion structure(s) or outfall(s) that it will control, and environmental, political, or institutional issues related to locating the control facility on the site.

F. Public Participation and Stakeholder Involvement

45. The Unified Government shall identify in the SSE Work Plan a public participation program that will ensure there is adequate public participation during the

development of the Unified Government's IOCP. The public participation program shall include, at a minimum, the following:

(a) The means by which the Unified Government will make information pertaining to the completion of the development of the IOCP available to the public for review. These activities may include website development, neighborhood/project meetings, newsletters, media management, and special events.

(b) The means by which the Unified Government shall solicit comments from the public on the completion of the development of the IOCP. The Unified Government shall make appropriate efforts to reach, at a minimum, homeowners, commercial businesses, industrial businesses, the media, community groups and neighborhood associations, civic organizations and clubs, business and trade associations, schools, service organizations, and related special interest organizations.

(c) Consideration of comments provided by the public as Unified Government completes the development of the IOCP.

IX. INTEGRATED OVERFLOW CONTROL PLAN

46. By no later than September 30, 2016, the Unified Government shall submit to EPA for review and approval in accordance with Section XII, with a copy to the State, an IOCP for the Sewer System developed using the information collected pursuant to Section VIII and reported in the SSS Characterization Report and the CSS Characterization Report. As part of the IOCP, the Unified Government shall complete the development of the LTCP for the CSS and a remedial plan for the SSS. The IOCP shall include specific measures and schedules that, when implemented, will ensure the Unified Government shall achieve and maintain compliance with

the requirements of its WWTP permits, the CWA and regulations promulgated thereunder, and EPA's CSO Policy.

47. The IOCP shall include an evaluation of the range of alternatives, developed for each Sewershed under Part IX, for efficacy in reducing or treating CSOs for the Design Year for providing Adequate Capacity in the SSS, based upon the range of control levels evaluated in the SSE Work Plan, for eliminating Bypasses (except as authorized under 40 C.F.R. § 122.41(m)) at the WWTPs, and for implementing Green Infrastructure technologies or BMPs, where feasible and appropriate. This evaluation shall consider the costs, effectiveness (e.g., for the CSS area, in terms of overflow volume reduction, pollutant of concern loading reductions, and frequency of activation reductions, etc.), and water quality benefits of the selected alternatives. The alternatives evaluated for the CSS as part of the IOCP shall be consistent with those identified in the CSO Policy.

48. In identifying, assessing and prioritizing alternatives for its IOCP, the Unified Government shall include an analysis of the following factors:

(a) impact on areas with low-income and minority communities, including the schedule for implementation, in consideration of EPA's Plan EJ 2014 (http://www.epa.gov/environmentaljustice/plan-ej/index.html) and Presidential Executive Order 12898;

(b) human health and environmental impact risks;

(c) frequency and volume of SSOs, CSOs, Unauthorized CSOs and Bypasses;

(d) integration of SSO remedial measures with LTCP projects; and

(e) effect of any changed (increased or decreased) SSS flows to the CSS and WWTPs.

49. In identifying, assessing and prioritizing alternatives for the CSS area in its IOCP, the Unified Government shall give the highest priority to controlling overflows to sensitive areas in accordance with the CSO Policy.

50. For each alternative or combination of alternatives evaluated as part of the IOCP applicable to the CSS area, including maximizing flow to the WWTP, the Unified Government's assessment shall include, at a minimum:

(a) the reduction in the average number of untreated CSOs for the Design Year;

(b) the percent wet weather capture achieved for the Design Year;

(c) a determination, expressed in present value, consistent, year-specific dollars, of the "project costs," as that term is described in Section 3.4.1 of EPA's August 1995 *Guidance for Long Term Control Plans*, for each alternative or combination of alternatives;

(d) an evaluation of the expected water quality improvements for every pollutant of concern in the receiving waters for the Design Year;

(e) an analysis of the estimated peak hourly and sustained flows to the Kaw Point WWTP for a variety of storm events of varying durations and return frequencies, and their effects on maximizing flows to the WWPT and treating such flows; and

(f) a "knee of the curve" cost-performance analysis for each selected alternative or combination of alternatives that will allow for the comparison of the costs to:

(i) the associated expected water quality improvements;

(ii) the reduction in volume of the CSOs;

(iii) the reduction in CSO events; and

(iv) the reduction in pollutant of concern loading from CSOs.

51. The LTCP shall utilize the methodology outlined in EPA's February 1997 *Combined Sewer Overflows: Guidance for Financial Capability Assessment and Schedule Development* ("EPA FCA"). As indicated in the EPA FCA, the Unified Government may also submit any additional documentation that would create a more accurate and complete picture of its financial capability.

52. For each alternative or combination of alternatives evaluated as part of the IOCP applicable to the SSS area, the Unified Government's assessment shall include, at a minimum:

(a) SSO reduction performance for the level of service range to be identified in the SSE Work Plan submitted under Paragraph 37 above;

(b) the integration on the range of alternatives considered for the CSS for areas of the SSS tributary to the CSS; and

(c) the estimated capital, annual operation and maintenance, and life-cycle costs expressed in present value, consistent, year-specific dollars.

53. The IOCP shall include:

(a) the selection of CSO control and treatment measures, including the construction of all Sewer System and WWTP improvements, necessary to ensure compliance with the technology-based and water-quality based requirements of the CWA, State law and regulation, and the Unified Government's Kaw Point Permit for the Design Year; and

(b) the selection of SSS control and construction projects, including the construction of all Sewer System and WWTP improvements, necessary to ensure compliance with the technology-based and water-quality based requirements of the CWA, with the goal of eliminating SSOs and Bypasses, other than Bypasses specifically authorized pursuant to 40 C.F.R. § 122.41(m), State law and regulation, and the Unified Government's applicable WWTP Permits.

54. The IOCP evaluation of alternatives for the CSS and SSS shall include an evaluation of the Unified Government's financial capability to fund the selected alternative or combination of alternatives. The Unified Government may present additional information to support the financial capacity analysis.

55. The IOCP shall include a proposed schedule for the design, construction, and implementation of all measures for the SSS and CSS areas. The schedule shall include a deadline for the completion of all construction and full implementation of all measures under the IOCP, which will be established by the Final Consent Decree. The schedule shall also specify the critical construction milestones for each measure, including, at a minimum, dates for:

(a) completion of design;

(b) commencement of construction; and

(c) achievement of full operation.

56. The IOCP shall include a Post-Construction Monitoring Program which shall be used to assess the effectiveness of the selected and completed control measures. The post-construction monitoring program shall be adequate to:

(a) measure compliance with water quality standards and protection of designated uses;

(b) assess and document the environmental benefits attributable to CSO control measures and SSS mitigation actions;

(c) update and enhance the collection system computer models; and

(d) provide public education and information on the need for implementation of the CSO control measures and SSS mitigation actions, any water quality improvements, and the progress made in achieving the performance criteria.

X. GREEN INFRASTRUCTURE

57. The Unified Government shall consider Green Infrastructure ("GI") alternatives as part of the SSS and CSS control alternatives under the IOCP. The IOCP shall contain the following minimum considerations for proposing a Green Infrastructure alternative to traditional gray controls:

(a) Identification of potential locations for GI: The Unified Government shall identify potential areas within the SSS and/or the CSS that would be suitable for development of a GI control measure. Each potential area shall be prioritized using considerations such as the ability to develop effective GI control measures, availability of land and benefits to minority and low income neighborhoods.

(b) Pilot Projects: The Unified Government shall, at its discretion, select pilot project(s) to develop demonstration GI control measures. The purpose of the pilot project(s) shall be to evaluate the effectiveness of the GI measure to reduce overflow volumes and frequency so that the Unified Government may choose to implement more extensive GI projects. The selection of pilot project(s) shall include details regarding the design, construction, operation, post-construction monitoring and evaluation of the effectiveness of the pilot project.

(i) Design criteria: The Unified Government shall establish design criteria for each pilot project so as to maximize the benefit of the GI control measure. Considerations may include the type of control measure (storage, infiltration, evapotranspiration, etc.), long term maintenance requirements, the ability of the Unified Government to properly operate and maintain the control measure and functionality of the control measure.

(ii) Post-construction monitoring: The Unified Government shall establish and implement a post-construction monitoring plan to evaluate the performance and effectiveness of the GI control measure pilot projects. Monitoring shall include at a minimum, rainfall and flow monitoring to gauge storage and/or infiltration performance.

(c) GI control measures proposal: Based on the performance of the pilot project(s), the Unified Government may propose, with EPA approval, to replace or supplement gray controls with GI controls during IOCP implementation.

58. The IOCP shall contain a schedule for the development of any GI pilot project(s) including specific milestones for the following activities:

(a) Project identification;

(b) Design;

(c) Construction;

(d) Performance monitoring/evaluation; and

(e) Final report with recommendations.

XI. IMPLEMENTATION OF THE INTEGRATED OVERFLOW CONTROL PLAN

59. After approval of the IOCP, and associated schedules, by EPA pursuant to the provisions of Section XII (Reporting, Certification and Approval of Submittals), the Unified Government agrees without anything further to modify this Consent Decree to incorporate the approved IOCP as an enforceable part of this Consent Decree.

XII. REPORTING, CERTIFICATION AND APPROVAL OF SUBMITTALS

60. Reports. The Unified Government shall submit the following notices and reports:

(a) Periodic Reports. After the Effective Date of this Consent Decree and until termination of this Decree pursuant to Section XXIII (Termination), the Unified Government shall submit to EPA Annual and Semiannual Reports, as identified in Subparagraphs (b) and (c), below, by email and by either U.S. Mail or an overnight delivery service determined appropriate in accordance with Section XIX (Notices). A copy of each Annual and Semiannual Report shall be provided to the State. The first Annual Report shall include information for the period of time beginning after the Effective Date of this Consent Decree to December 31, 2013, and shall be submitted no later than February 15, 2014. Succeeding Annual Reports shall be submitted no later than February 15 each year until termination of this Consent Decree. Semiannual Reports shall be submitted no later than August 15 each year until termination of this Consent Decree.

(b) Each Annual and Semiannual Report shall cover the activities completed in the immediately preceding reporting period, i.e., January 1 through June 30 activities are reportable in the Semiannual Report and July 1 through December 31 activities are reportable in the Annual Report. Each such Report shall include, at a minimum:

(i) a description of major projects and activities conducted during the most recently completed six-month period to comply with the requirements of this Consent Decree;

(ii) a summary of SSOs, Unauthorized CSOs and Bypasses during the six month period, including the date, locations and associated WWTP collection system, estimated volume, rainfall event as measured by the nearest gauge, and cause (if known) of all Sewer System Overflows for the most recently completed six month period;

(iii) the anticipated major projects and activities that will be performed in the next six month period to comply with the requirements of this Consent Decree;

(iv) if the Unified Government violates any requirement of this Consent Decree or has reason to believe that it is likely to violate any requirement of this Consent Decree in the future, the Unified Government shall notify the United States of such violation and its likely duration, with an explanation of the violation's likely cause and of the remedial steps taken, and/or to be taken, to prevent or minimize such violation. If the cause of a violation cannot be fully explained at the time the report is due, the Unified Government shall include a statement to that effect in the report. The Unified Government shall investigate to determine the cause of the violation and then shall submit an amendment to the report, including a full explanation of the cause of the violation, within thirty (30) days after the date of submittal of the semiannual report;

(v) any additional information that demonstrates that the Unified Government is implementing the remedial measures required in this Consent Decree; and

(vi) any report or other information required by this Consent Decree to be submitted or included in an Annual or Semiannual Report due on a specific date.

(c) Annual Reports. Each Annual Report shall, in addition to the information identified in Subparagraph (b), above, also include the following information:

(i) a report on performance measures under the CMOM Program, including:

(A) the number of miles and locations of sewer pipes that were cleaned during the preceding calendar year pursuant to Paragraph 33(b), and if the Unified Government has not achieved the required mileage of sewer pipe cleaning, identify and discuss the reasons why the mileage requirement was not achieved;

(B) the number of manhole inspections, the number of manhole frame adjustments, and the number of manholes that were permanently repaired/rehabilitated/replaced during the preceding calendar year pursuant to Paragraph 33(c), and if the Unified Government has not achieved the required number of manholes inspected and/or repaired, rehabilitated, and replaced, identify and discuss the reasons why these requirements were not achieved;

(C) the locations and number of miles of sewer pipes that were temporarily and/or permanently repaired, rehabilitated or replaced, and a summary of all acute defects repaired during the preceding calendar year pursuant to Paragraph 33(d), and if the Unified Government has not achieved the required mileage of sewer pipe repair, replacement or rehabilitation, identify and discuss the reasons why the mileage requirement was not achieved;

(D) the number of Pump Stations that were inspected, as well as the location and capacity of those Pump Stations inspected during the preceding calendar year pursuant to Paragraph 33(e);

(E) the locations and number of miles of Force Mains that were inspected and/or repaired during the preceding calendar year pursuant to Paragraph 33(f), and if the required number of miles of Force Mains that were inspected and/or repaired has not been achieved, identify and discuss the reasons why the mileage requirement was not achieved; and

(F) if the Unified Government does not meet its service levels as set forth in its CMOM Program Plan pursuant to Paragraph 29, submit for EPA's approval proposed revisions to its CMOM Program Plan that are necessary to achieve the service levels;

(ii) a summary of each remedial measure and capital project implemented during the preceding Calendar Year pursuant to this Consent Decree, including a description of the Unified Government's compliance with the requirements of Sections V through X of this Consent Decree;

(iii) updated information for the preceding year of all known SSOs, Unauthorized CSOs, and Bypasses, providing:

(A) updated map(s) of the Sewer System that identify the locations of the known SSOs, Unauthorized CSOs, Bypasses, Sewersheds, WWTPs, Pumping Stations, Force Mains, wastewater storage facilities, intra- or inter-Sewershed flow control structures, outfalls, and Private Property Backups, that occurred during the preceding year, with a coding system identifying the cause(s) of the Sewer System Overflows;

(B) updated listings of SSOs, Unauthorized CSOs and Bypasses with sufficient information to demonstrate the Unified Government is tracking location, estimated volumes and causes, if known, of such events;

(C) comparison of the number of SSOs, Unauthorized CSOs and Bypasses for the past three years along with corresponding rainfall data measured at the nearest available gauge; and

(D) based in NMC Program implementation, a report on the estimated frequency, volume, if known, and CSO Outfall number(s) for CSO activations.

(d) MS4 Annual Report. The Unified Government shall send to KDHE, with a copy to EPA, its MS4 Annual Report on the date specified in the effective MS4 Permit.

61. All notices and reports required to be submitted pursuant to this Consent Decree shall be submitted to the recipients specified in accordance with Section XIX of this Consent Decree (Notices).

62. Certification Statement. Each written notice, document or report submitted by the Unified Government to the United States under this Consent Decree shall be signed by a responsible party of the Unified Government, as defined by 40 C.F.R. § 122.22, and include the following certification:

> I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

This certification requirement does not apply to emergency or similar notifications where compliance would be impractical.

63. Nothing in this Section relieves the Unified Government of the obligation to provide the requisite notice for purposes of Section XIV (Force Majeure) of this Consent Decree.

64. The reporting requirements of this Consent Decree do not relieve the Unified Government of any reporting obligations required by the Clean Water Act or its implementing regulations or by any other federal, state, or local law, regulation, permit, or other requirement.

65. Review and Comment by the State. The State may, within thirty (30) days of receipt of a copy of any Deliverable submitted by the Unified Government to the State pursuant to this Consent Decree, provide to EPA written comments or recommendations. If a time constraint imposed by this Consent Decree does not allow thirty (30) days for the State to provide comments to EPA, EPA shall notify the State of the reasonable time period in which it may provide written comments to EPA, and the State shall provide any written comments within that time period. EPA agrees to consider any written comments by the State that are received by EPA within the time periods described in this Paragraph, but EPA may, at its sole unreviewable discretion, adopt or not adopt comments submitted by the State.

66. Approval of Deliverables. After review of any modification of a plan, work plan, statement of work, report, or other item that is required to be submitted pursuant to this Consent Decree for EPA approval, EPA may, in writing: (a) approve the submission; (b) approve the submission upon specified conditions; (c) approve part of the submission and disapprove the remainder; or (d) disapprove the submission. EPA shall make good faith efforts to review and approve, approve with modifications, or disapprove all submittals required by the Consent

Decree within ninety (90) days of EPA's receipt of same. In the event that EPA's review of any submittal exceeds ninety (90) days, then the Unified Government may provide written notice to EPA of all actions under this Consent Decree that will be delayed or otherwise affected by EPA's extended review. Upon providing such notice, the due date for all affected actions will be extended by the number of days beyond ninety (90) that EPA requires to provide its approval, modification and approval, or disapproval to the Unified Government, unless within the 90 day period EPA provides notice, along with a written explanation, to the Unified Government that an extension of a due date is not warranted. If EPA denies the extension of a due date, the Unified Government may initiate dispute resolution pursuant to Section XV of this Consent Decree (Dispute Resolution).

67. If the submission is approved pursuant to Subparagraph 66(a), the Unified Government shall take all actions required by the plan, report, or other document, in accordance with the schedules and requirements of the plan, report, or other document, as approved. If the submission is conditionally approved or approved only in part, pursuant to Paragraph 66, Subparagraphs (b) or (c), the Unified Government shall, upon written direction of EPA take all actions required by the approved plan, report, or other item that EPA determines are technically severable from any disapproved portions, subject to the Unified Government's right to dispute under Section XV of this Decree (Dispute Resolution), the specified conditions and/or determination of severability.

68. If the submission is disapproved in whole or in part pursuant to Paragraph 66, Subparagraphs (c) or (d), then, subject to the Unified Government's right to dispute the disapproval under Section XV of this Consent Decree (Dispute Resolution), the Unified

Government shall correct all deficiencies and resubmit the plan, report, or other item, or disapproved portion thereof, for approval, in accordance with the preceding Paragraphs within ninety (90) days for plans and sixty (60) days for reports or other items, or such longer time as specified by EPA in such notice or agreed to by EPA in writing.

69. Any Stipulated Penalties applicable pursuant to Section XIII, below, to the original submission, as provided in this Section XII of this Decree, shall accrue during the time period specified in Paragraph 68 above, but shall not be payable unless the resubmission is untimely or is disapproved for material deficiencies; provided that, if the original submission was so deficient as to constitute a material breach of the Unified Government's obligations under this Decree, the Stipulated Penalties applicable to the original submission shall be due and payable notwithstanding any subsequent resubmission.

70. If a resubmitted plan, report, or other item, or portion thereof, is disapproved in whole or in part, EPA may again require the Unified Government to correct any deficiencies, in accordance with the preceding Paragraphs subject only to the Unified Government's right to invoke Dispute Resolution. EPA may also deem the Unified Government to be out of compliance with this Consent Decree for failure to timely submit the submittal in compliance with the requirements of this Consent Decree, and may assess stipulated penalties pursuant to this Consent Decree, subject only to the rights of the Unified Government under the Dispute Resolution provisions of this Consent Decree.

71. Obligation to Implement. In the event that EPA approves or approves upon conditions any submittal pursuant to this Section, the Unified Government shall proceed to take

any action required to implement the submittal as approved by EPA, subject only to the rights of the Unified Government under the dispute resolution provisions of this Consent Decree.

72. Submittals are Enforceable. All submittals required to be approved, including all schedules set forth therein, shall be enforceable under this Consent Decree as if they were set forth herein upon approval or approval upon conditions (after conclusion of any Dispute Resolution period). Any portion of a submittal that is not specifically disputed by the Unified Government shall be enforceable during any Dispute Resolution period, provided that implementation of the non-disputed portions of the submittal is not dependent upon implementation of the disputed portion.

73. Revisions to Submittals. The United States and the Unified Government recognize that the Unified Government may need or want to revise certain submittals during the term of this Consent Decree. Such revisions shall not be considered modifications to the Consent Decree for purposes of Section XXII of this Consent Decree (Modification). The Unified Government must obtain EPA's prior written approval of any revision to the substance of any submittal initially required to be approved.

XIII. STIPULATED PENALTIES

74. The Unified Government shall be liable for Stipulated Penalties to the United States for violations of obligations of this Consent Decree unless excused under Section XIV (Force Majeure). A violation includes failing to perform any obligation required by the terms of this Decree, including any statement of work or schedule approved under this Decree, according to all applicable requirements of this Decree and within the specified time schedules established by or approved under this Decree.

75. Compliance Measures Related to Storm Sewer System: The following Stipulated Penalties shall accrue for each violation by the Unified Government of Section VI of this Decree, as follows:

(a) Failure to timely submit each SOP pursuant to Paragraph 12 of this Consent Decree. "Timely submit" shall mean the report or submittal is made by the date specified in this Consent Decree.:

Period Beyond Submittal Date	Penalty Per Violation Per 30-Day Period
1-30 days	$5,000 per 30-day period
more than 30 days	$7,500 per 30-day period

(b) Failure to demonstrate through documentation and/or explanation in its Annual MS4 Report, submitted pursuant to Paragraph 60(d) of this Consent Decree, timely implementation or completion, as applicable, of each Best Management Practice ("BMP") by the annual completion date specified in the Compliance Schedule for each BMP identified in the SWMP, attached as Appendix E:

Period of Noncompliance	Penalty Per BMP Violation Per 30-Day Period
1st through 90th day	$4,000 per 30-day period
91st day through 120th day	$7,500 per 30-day period
121st day and beyond	$10,000 per 30-day period

(c) Failure to timely adopt or maintain an ordinance as required by Paragraph 14 of this Decree.

Period of Noncompliance	Penalty Per Violation Per 30-Day Period
1st through 90th day	$4,000 per 30-day period
91st day through 120th day	$7,500 per 30-day period

121st day and beyond	$10,000 per 30-day period

For violations of Paragraph 14, stipulated penalties shall not be assessed where the failure is caused by an order from a court that stays, vacates or otherwise invalidates such an ordinance.

76. Compliance Measures Related to Sewer System: The following Stipulated Penalties shall accrue for each violation of this Decree, as follows:

(a) Timely and Complete Submittals. For any failure to timely submit or complete any of the submittals required in Sections V (Information Management System), VII (Ongoing Construction and Programmatic Activities for the Sewer System), VIII (Evaluation of the Sewer System), IX (Integrated Overflow Control Plan for the Sewer System), and XII (Reporting) of this Consent Decree, the Unified Government shall pay stipulated penalties, as follows:

Period Beyond Submittal Date	Penalty Per Violation Per Day
1-30 days	$1,000 per day
31 through 60 days	$2,000 per day
61 days and beyond	$3,000 per day

(b) Sewer System Remedial Measures Pursuant to Sections VII and VIII. For each day the Unified Government fails to timely complete remedial measures, or to meet compliance milestones for such remedial measures, required by Sections VII (Ongoing Construction and Programmatic Activities for the Sewer System) and VIII (Evaluation of the Sewer System) of this Consent Decree or in an approved compliance program or plan developed pursuant to this Consent Decree, the Unified Government shall pay stipulated penalties for each day of each such violation as follows:

Period Beyond Completion Date	Penalty Per Violation Per Day
1 - 30 days	$1,000 per day
31 - 60 days	$2,000 per day
61 days and beyond	$4,000 per day

(c) Sewer System Overflows.

(i) Dry Weather CSOs from CSO Outfalls: For each CSO that occurs after the Date of Lodging of the Partial Consent Decree from a permitted CSO Outfall during a dry weather period, the Unified Government shall pay a stipulated penalty of $2,500 per day during which the CSO occurs.

(ii) Capacity-Related SSOs and Unauthorized CSOs: For each Capacity-Related SSO or Unauthorized CSO that occurs after the Unified Government has completed the remedial measures for that Sewershed pursuant to Section VII of the Consent Decree or Section IX of the Consent Decree, as implemented pursuant to Section XI (Implementation of the IOCP) that reaches waters of the United States, the Unified Government shall pay a stipulated penalty in the following amounts:

$1,000 for any discharge of 1,000 gallons or less:

$2,500 for any discharge more than 1,000 gallons but less than 10,000; and

$5,000 for any discharge of 10,000 gallons or more.

(iii) O&M-Related SSOs and Unauthorized CSOs: For each non-capacity related SSO or Unauthorized CSO, other than a Private Property Backup, that occurs due to the Unified Government's failure to properly implement the requirements of subsection VII.F. or VII.G. of this Decree (Nine Minimum Controls Plan or CMOM Program Plan), as applicable, the Unified Government shall pay a stipulated penalty of $2,500 per day of occurrence. The Unified Government bears the burden of demonstrating that any such non-capacity related SSO or Unauthorized CSO occurred despite the Unified Government's best efforts to implement the Nine Minimum Control Plan or CMOM Program Plan, as applicable.

(iv) Unpermitted Bypasses:

(A) For each Unpermitted Bypass at the Kaw Point WWTP that occurs before the deadline established for eliminating such bypasses pursuant to the terms of the approved IOCP, as implemented pursuant to Section XI (Implementation of the IOCP) of this Consent Decree, the Unified Government shall pay a stipulated penalty of $1,000 per day during which an Unpermitted Bypass occurs;

(B) For each Unpermitted Bypass at the Kaw Point WWTP that occurs after the deadline established for eliminating such bypasses to an agreed level of service, pursuant to the terms of the approved IOCP, as implemented pursuant to Section XI (Implementation of the IOCP) of this consent Decree, the Unified Government shall pay a stipulated penalty of $5,000 per day during which an Unpermitted Bypass occurs; and

(C) For each Unpermitted Bypass at any WWTP other than the Kaw Point WWTP, the Unified Government shall pay a stipulated penalty of $5,000 each day during which an Unpermitted Bypass occurs.

77. Stipulated Penalties under this Section shall begin to accrue on the day after performance is due or on the day a violation occurs, whichever is applicable, and shall continue to accrue until performance is satisfactorily completed or until the violation ceases. Stipulated Penalties shall accrue simultaneously for separate violations of this Consent Decree. The

Unified Government shall pay any Stipulated Penalty within thirty (30) days of receiving a written demand by the United States, unless the United States and the Unified Government enter into Dispute Resolution, in which case the provisions of Paragraph 79 apply.

78. The United States may, in the unreviewable exercise of its discretion, reduce or waive any Stipulated Penalties otherwise due the United States under this Consent Decree.

79. Stipulated Penalties shall continue to accrue as provided in Paragraph 77, above, during any Dispute Resolution, but need not be paid until the following:

(a) If the dispute is resolved by agreement or by a decision of the United States that is not appealed to the Court, the Unified Government shall pay accrued penalties agreed or determined to be owing to the United States within thirty (30) days of the effective date of the agreement or the receipt of the United States' decision or order;

(b) If the dispute is appealed to the Court, the Unified Government shall pay all accrued penalties determined by the Court to be owing within sixty (60) days of receiving the Court's decision or order, except as provided in Subparagraph (c), below;

(c) If there is an appeal of the District Court's decision, the Unified Government shall pay all accrued penalties determined to be owed within fifteen (15) days of receiving the final appellate court decision.

80. The Unified Government shall make payment of Stipulated Penalties owing to the United States in accordance with instructions provided to the Unified Government by the Financial Litigation Unit ("FLU") of the United States Attorney's Office for the District of Kansas. The FLU shall provide the payment instructions to:

Lew Levin, Chief Financial Officer
Unified Government of Wyandotte County/Kansas City, Kansas
701 North 7th Street, Suite 330

Phone: 913-573-5270
Fax: 913-573-2890
E-mail: llevin@wycokck.org

Jody Boeding, Chief Counsel
Unified Government of Wyandotte County/Kansas City, Kansas
701 N. 7th Street
Suite 961
Phone: 913-573-5060
Fax: 913-573-5243
E-mail: jboeding@wycokck.org

81. At the time of payments of stipulated penalties required by this Section, the Unified Government shall simultaneously send written notice of payment and a copy of any transmittal documentation to the United States in accordance with Section XIX of this Decree (Notices). The notices shall reference the Civil Action Number and DOJ Number 90-5-1-1-09463. The notice shall state that the payment is for Stipulated Penalties and shall state for which violation(s) the penalties are being paid.

82. If the Unified Government fails to pay Stipulated Penalties according to the terms of this Consent Decree, the Unified Government shall be liable for interest on such penalties, as provided for in 28 U.S.C. §1961, accruing as of the date payment became due.

83. Payment of stipulated penalties as set forth above shall be in addition to any other rights or remedies which may be available to the United States by reason of the Unified Government's failure to comply with requirements of this Consent Decree, and any applicable federal, State or local laws, regulations, NPDES Permits, and all other applicable permits.

XIV. FORCE MAJEURE

84. A "force majeure event" is any event arising from causes beyond the control of the Unified Government, its contractors, or any entity controlled by the Unified Government,

that delays or prevents the performance of any obligation under this Consent Decree despite the Unified Government's best efforts to fulfill the obligation. The requirement that the Unified Government exercise best efforts to fulfill the obligations includes using best efforts to anticipate any potential force majeure event and best efforts to address the effects of any such event (a) as it is occurring and (b) after it has occurred to prevent or minimize any resulting delay to the greatest extent possible. "Force Majeure" does not include the Unified Government's financial inability to perform any obligation under this Consent Decree.

85. If any event occurs or has occurred that may delay the performance of any obligation under this Consent Decree, whether or not caused by a force majeure event, the Unified Government shall provide written notice to EPA by electronic or other means (in accordance with Section XIX) within 15 days after the time the Unified Government first knew of, or by the exercise of due diligence, should have known of, a claimed force majeure event. The notice shall state the anticipated duration of any delay, its cause(s), the Unified Government's past and proposed actions to prevent or minimize any delay, a schedule for carrying out those actions, the Unified Government's rationale for attributing any delay to a force majeure event, and a statement as to whether, in the opinion of the Unified Government, such event may cause or contribute to an endangerment to public health, welfare or the environment. The Unified Government shall include with any notice all available documentation supporting the claim that the delay was attributable to a force majeure. Failure to comply with the above requirements shall preclude the Unified Government from asserting any claim of force majeure for that event for the period of time of such failure to comply, and for any additional delay caused by such failure. The Unified Government shall be deemed to know of any

circumstance of which the Unified Government, any entity controlled by the Unified Government, or the Unified Government's contractors knew or should have known.

86. If the United States agrees that a force majeure event has occurred, the United States will agree to extend the time for the Unified Government to perform the affected requirements for the time necessary to complete those obligations. An extension of time to perform the obligations affected by a force majeure event shall not, by itself, extend the time to perform any other obligation. The United States will notify the Unified Government in writing of the length of the extension, if any, for performance of the obligations affected by the force majeure event. When the United States agrees to a material extension of time, the appropriate modification shall be made pursuant to Section XXII of this Consent Decree (Modification).

87. If the United States does not agree that the delay or anticipated delay has been or will be caused by a force majeure event, the United States will notify the Unified Government in writing of their decision. The United States' position shall be binding, unless the Unified Government invokes Dispute Resolution under Section XV of this Consent Decree. In any such dispute, the Unified Government bears the burden of proving, by a preponderance of the evidence, that each claimed force majeure event is a force majeure event, that the Unified Government gave the notice required by Paragraph 85, that the force majeure event caused any delay that the Unified Government claims was attributable to that event, that the duration of the extension sought will be warranted under the circumstances, and that the Unified Government exercised best efforts to prevent or minimize any delay of the performance of any obligation under this Consent Decree caused by the event.

XV. **DISPUTE RESOLUTION**

88. Unless otherwise expressly provided for in this Consent Decree, the dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes arising under or with respect to this Consent Decree.

89. Informal Dispute Resolution. Any dispute subject to dispute resolution under this Consent Decree shall first be the subject of informal negotiations. The dispute shall be considered to have arisen when the Unified Government sends the United States a written Notice of Dispute. Such Notice of Dispute shall state clearly the matter in dispute. The period of informal negotiations shall not exceed thirty (30) days from the date the dispute arises, unless that period is modified by written agreement of the United States and the Unified Government. If the United States and the Unified Government cannot resolve a dispute by informal negotiations, then the position advanced by the United States shall be considered binding unless, within thirty (30) days after the conclusion of the informal negotiation period, the Unified Government invokes formal dispute resolution procedures as set forth below.

90. Formal Dispute Resolution. The Unified Government shall invoke formal dispute resolution procedures, within the time period provided in the preceding Paragraph, by serving on the United States a written Statement of Position regarding the matter in dispute. The Statement of Position shall include, but may not necessarily be limited to, any factual data, analysis, or opinion supporting the Unified Government's position and any supporting documentation relied upon by the Unified Government.

91. The United States shall serve its Statement of Position within forty-five (45) days of receipt of the Unified Government's Statement of Position. The United States' Statement of

Position shall include, but may not necessarily be limited to, any factual data, analysis, or opinion supporting that position and any supporting documentation relied upon by the United States. If within ten (10) days of receiving the United States' Statement of Position, the Unified Government requests to confer with the United States about the Statement of Position, the United States will confer (in person and/or by telephone) with the Unified Government, but such a conference shall be concluded no later than twenty-one (21) days after the issuance of the United States' Statement of Position. The United States will reaffirm or amend their Statement of Position within fourteen (14) days after the conclusion of the conference. The United States' Statement of Position shall be binding on the Unified Government unless the Unified Government files a motion for judicial review of the dispute in accordance with the following Paragraph.

92. The Unified Government may seek judicial review of the dispute by filing with the Court and serving on the United States in accordance with Section XIX of this Consent Decree (Notices) a motion requesting judicial resolution of the dispute. If no conference was requested pursuant to Paragraph 91, the Unified Government's motion must be filed within thirty (30) days of receipt of the United States' Statement of Position pursuant to Paragraph 91. If a conference was requested pursuant to the previous Paragraph, the Unified Government's motion must be filed within thirty (30) days of receipt of the United States' reaffirmation of its original Statement of Position or issuance of an amended Statement of Position. The motion shall contain a written statement of the Unified Government's position on the matter in dispute, including any supporting factual data, analysis, opinion, or documentation, and shall set forth the

relief requested and any proposed schedule within which the dispute must be resolved for orderly implementation of the Consent Decree.

93. The United States shall respond to the Unified Government's motion within the time period allowed by Local Rule 6.1(d) of this Court. The Unified Government may file a reply memorandum, within the time period allowed by Local Rule 6.1(d).

94. Standard of Review:

(a) Disputes Concerning Matters Accorded Record Review. Except as otherwise provided in this Consent Decree, in any dispute brought under Paragraph 90 pertaining to the adequacy or appropriateness of plans, procedures to implement plans, schedules or any other items requiring approval by EPA under this Consent Decree; the adequacy of the performance of work undertaken pursuant to this Consent Decree; and all other disputes that are accorded review on the administrative record under applicable principles of administrative law, the Unified Government shall have the burden of demonstrating, based on the administrative record, that the position of the United States is arbitrary and capricious or otherwise not in accordance with law.

(b) Other Disputes. Except as otherwise provided in this Consent Decree, in any other dispute brought under Paragraph 90, the Unified Government shall bear the burden of demonstrating that its position complies with the requirements of this Consent Decree and fulfills the Objectives specified in Section III.

95. The invocation of dispute resolution procedures under this Section shall not, by itself, extend, postpone, or affect in any way any obligation of the Unified Government under

this Consent Decree, unless and until final resolution of the dispute so provides. Stipulated Penalties shall be assessed and paid as provided in Section XIII (Stipulated Penalties).

XVI. INFORMATION COLLECTION AND RETENTION

96. The United States and its representatives, including attorneys, contractors, and consultants, shall have the right to enter the Unified Government facilities at all reasonable times, upon presentation of credentials, to:

(a) monitor the progress of activities required under this Consent Decree;

(b) verify any data or information submitted to the United States in accordance with the terms of this Consent Decree;

(c) obtain samples;

(d) obtain documentary evidence, including photographs and similar data; and

(e) assess the Unified Government's compliance with this Consent Decree.

97. The Unified Government shall maintain copies of any reports, plans, permits, and documents submitted to EPA pursuant to this Consent Decree, including any underlying research and data supporting such submittals, for a period of five (5) years from the date of submission. Where a contractor fails to retain such documents, and the Unified Government can demonstrate that the contractor's missing or destroyed documents contained the same information as documents in the possession of the Unified Government, the Unified Government shall not be liable for the contractor's failure to retain such documents. Drafts of final documents or plans, and non-substantive correspondence and emails do not need to be retained. This record retention requirement shall apply regardless of any corporate or institutional document retention policy to

the contrary. At any time during this record-retention period, the United States may request copies of any documents or records required to be maintained under this Paragraph.

98. Before destroying any documents or records subject to the requirements of the preceding Paragraph, the Unified Government shall notify the United States at least ninety (90) days prior to the destruction of any such records or documents, and, upon request by the United States, the Unified Government shall deliver any such records or documents to EPA. The Unified Government may assert that certain documents, records, or other information are privileged under the attorney-client privilege or any other privilege recognized by federal law. If the Unified Government asserts such a privilege, it shall provide the following: (a) the title of the document, record, or information; (b) the date of the document, record, or information; (c) the name and title of the author of the document, record, or information; (d) the name and title of each addressee and recipient; (e) a description of the subject of the document, record, or information; and (f) the privilege asserted.

99. This Consent Decree in no way limits or affects any right of entry and inspection, or any right to obtain information, held by the United States or the State pursuant to applicable federal or state laws, regulations, or permits, nor does it limit or affect any duty or obligation of the Unified Government to maintain records or information imposed by applicable federal or state laws, regulations, permits, or orders.

XVII. EFFECT OF SETTLEMENT/RESERVATION OF RIGHTS

100. This Consent Decree is a partial remedy for the civil claims of the United States for the violations alleged in the Complaint filed in this action. Therefore, this Consent Decree does not resolve these civil claims and is without prejudice to the United States' right to seek

further relief to address these claims or any future claims, including, but not limited to, further injunctive relief, and civil penalties, and the right of the United States to seek further administrative relief to address these claims. It is the present intention of the Parties to seek to negotiate a modification to this Consent Decree or a subsequent consent decree to fully resolve the civil claims of the United States for the violations alleged in the Complaint. However, the Parties recognize that such negotiations may not result in such a resolution and that the United States reserves the right to take such actions as it deems appropriate and necessary to resolve these claims and any future claims. In this and any subsequent administrative or judicial proceeding initiated by the United States for injunctive relief, civil penalties, or other appropriate relief relating to the Unified Government's compliance with the Clean Water Act, the Unified Government shall not assert, and may not maintain, any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim preclusion, claim-splitting, or other defenses based upon any contention that the claims raised by the United States in the subsequent proceeding were or should have been brought in the instant case. In this and any subsequent administrative or judicial proceeding initiated by the United States for injunctive relief, civil penalties, or other appropriate relief relating to the Unified Government's compliance with the Clean Water Act, Plaintiff shall not assert, and may not maintain, that the Unified Government is barred or in any way hindered from asserting any defense or claim based upon the principles of waiver, res judicata, collateral estoppel, issue preclusion, claim preclusion, claim-splitting, or other principles based upon any contention that the defense or claim raised by the Unified Government in the subsequent proceeding were or should have been brought in the instant case.

101. The United States reserves all legal and equitable remedies available to enforce the provisions of this Consent Decree, except as expressly stated herein, and the Unified Government reserves all defenses thereto. This Consent Decree shall not be construed to prevent or limit the rights of the United States to obtain penalties or injunctive relief under the Clean Water Act or its implementing regulations, or under other federal or state laws, regulations, or permit conditions. The United States further reserves all legal and equitable remedies to address any imminent and substantial endangerment to the public health or welfare or the environment arising at, or posed by, the Unified Government, whether related to the violations addressed in this Consent Decree or otherwise.

102. This Consent Decree is not a permit, or a modification of any permit, under any federal, state, or local laws or regulations, and the Unified Government's compliance with the Consent Decree shall be no defense to any action commenced by the United States pursuant to any such laws, regulations, or permits. The Unified Government is responsible for achieving and maintaining complete compliance with all applicable federal, state, and local laws, regulations, and permits. The United States does not, by its consent to the entry of this Consent Decree, warrant or aver in any manner that the Unified Government's compliance with any aspect of this Consent Decree will result in compliance with provisions of the Clean Water Act or with any other provisions of federal, state, or local laws, regulations, or permits.

103. This Consent Decree does not limit or affect the rights of the Unified Government or of the United States against any third parties, not party to this Consent Decree. The effect of this Consent Decree on the rights of third parties, not party to this Consent Decree, against the Unified Government shall be as provided by law.

104. Nothing in this Consent Decree limits the rights or defenses available under Section 309(e) of the Clean Water Act, 33 U.S.C.§1319(e), in the event that the laws of the State, as currently or hereafter enacted, may prevent the Unified Government from raising the revenues needed to comply with this Decree.

105. This Consent Decree shall not be construed to create rights in, or grant any cause of action to, any third party not party to this Consent Decree.

XVIII. COSTS

106. The Parties shall bear their own costs of this action, including attorneys fees, except that the United States shall be entitled to collect the costs (including attorneys fees) incurred in any action necessary to enforce this Consent Decree or to collect any portion of the civil penalty or any Stipulated Penalties due but not paid by the Unified Government.

XIX. NOTICES

107. Unless otherwise specified herein, whenever notifications, submissions, or communications are required by this Consent Decree, they shall be made in writing, indicate the title "United States v. Unified Government and the State of Kansas" in the subject matter line of the transmittal's cover page, and be addressed as follows:

To the United States:

Chief, Environmental Enforcement Section
Environment and Natural Resources Division
U.S. Department of Justice
Box 7611 Ben Franklin Station
Washington, D.C. 20044-7611
Re: DOJ No. 90-5-1-1-09463

&

Chief, Water Enforcement Branch
Water, Wetlands and Pesticides Division
Environmental Protection Agency, Region 7
11201 Renner Road
Lenexa, Kansas 66219

&

Chief, Water Programs Branch
Office of Regional Counsel
Environmental Protection Agency, Region 7
11201 Renner Road
Lenexa, Kansas 66219

To EPA only, as opposed to the United States:

Chief, Water Enforcement Branch
Water, Wetlands and Pesticides Division
Environmental Protection Agency, Region 7
11201 Renner Road
Lenexa, Kansas 66219

&

Chief, Water Programs Branch
Office of Regional Counsel
Environmental Protection Agency, Region 7
11201 Renner Road
Lenexa, Kansas 66219

For verbal notification:
Chief, Water Enforcement Branch
913/551-7544

To the State of Kansas through KDHE:

Director, Bureau of Water
Kansas Department of Health and Environment
1000 Jackson St. – Suite 420
Topeka, KS 66612-1367

For verbal notification:
Director, Bureau of Water
785/296-5500

To The Unified Government:

Chief Counsel
Department of Legal Services
Unified Gov't of Wyandotte County/KCK
701 N. 7th Street
Suite 961
Kansas City, Kansas 66101

Director of Public Works
Unified Gov't of Wyandotte County/KCK
701 N. 7th Street, 7th Floor
Kansas City, Kansas 66101

108. Where specifically authorized within this Consent Decree, or as agreed by the Parties in writing, submittals may be made via electronic transmittal to the e-mail address for each addressee identified in Paragraph 107, above.

109. Any Party may, by written notice to the other Parties, change its designated notice recipient or notice address.

110. Notices submitted pursuant to this Section shall be deemed submitted upon the date they are postmarked and mailed, provided to a reputable overnight delivery service, or where appropriate, sent via electronic mail, provided a message of non-deliverability is not received, unless otherwise provided in this Consent Decree or by mutual agreement of the Parties in writing.

XX. EFFECTIVE DATE

111. The Effective Date of this Consent Decree shall be the date upon which this Consent Decree is entered by the Court; provided however, that the Unified Government agrees that it shall be bound to perform duties scheduled to occur prior to the Effective Date. In the event the United States withdraws or withholds consent to this Decree before entry, or the Court declines to enter the Decree, then the preceding requirement to perform duties scheduled to occur prior to the Effective Date shall be null and void.

XXI. RETENTION OF JURISDICTION

112. The Court shall retain jurisdiction over the case until termination of this Consent Decree, for the purpose of resolving disputes arising under this Decree or entering orders modifying this Decree, pursuant to Sections XV (Dispute Resolution) and XXII (Modification), or effectuating or enforcing compliance with the terms of this Decree.

XXII. MODIFICATION

113. The terms of this Consent Decree may be modified only by a subsequent written agreement signed by the United States and the Unified Government or by further order of the Court. Where a modification agreed upon by the United States and the Unified Government constitutes a material change to any term of this Decree, it shall be effective only upon approval by the Court. Non-material changes to this Decree (including Appendices) may be made by written agreement of the United States and the Unified Government without Court approval.

114. Any disputes concerning modification of this Decree shall be resolved pursuant to Section XV of this Decree (Dispute Resolution), provided, however, that, instead of the burden of proof provided by Paragraph 94, the Party seeking the modification bears the burden of demonstrating that it is entitled to the requested modification in accordance with Federal Rule of Civil Procedure 60(b).

XXIII. TERMINATION

115. The Consent Decree is subject to termination only after the Unified Government certifies that it has achieved and maintained compliance with all requirements of this Consent Decree, including, without limitation, (a) payment of all penalties and stipulated penalties due, (b) submission of all Deliverables and approval of all plans required in Sections V, VI and VII or in any amendment to this Consent Decree, (c) completion of all Work and implementation of all the requirements in the plans required in Sections V, VI, VII, VIII, IX, X and XI of this Consent Decree or in any modification of this Consent Decree. A determination by EPA that the Consent Decree should be terminated shall be based on a consideration of whether the Unified Government has satisfied all of the requirements listed above.

116. Notwithstanding the above, the following portions of this Consent Decree may be terminated after the Unified Government certifies that it has met all requirements of the respective portions of the Consent Decree and has satisfactorily complied with its required plan or program for a period of five (5) years following the date of approval of the plan or program by EPA: Section V (Information Management System), Section VI (Compliance Measures Relating to Storm Sewer System), Section VII(D) (Collection System Release Response Plan), Section VII(F) (Nine Minimum Controls Plan), and Section VII(G) (Capacity, Management, Operation, and Maintenance). The Fats, Oil and Grease Control Program Plan, pursuant to Section VII(C), may be terminated after the Unified Government certifies that it has met all requirements of that portion of the Consent Decree and has satisfactorily complied with its plan for a period of two (2) years following certification by the Unified Government, pursuant to Paragraph 20, that it is fully implementing the FOG Control Program Plan.

117. The Unified Government may serve upon the United States a request that the United States and the Unified Government jointly determine that this Consent Decree be terminated, in whole or in part. Any such request shall be in writing and shall include a certification that the requirements of this Consent Decree have been met. If the United States agrees that the Unified Government has satisfied the requirements of this Consent Decree, the United States and the Unified Government shall submit for the Court's approval, a joint stipulation terminating the Consent Decree, or appropriate portions thereof. If the United States determines not to seek termination of the Consent Decree in whole or in part because the requirements of this Consent Decree have not been met, it shall so notify the Unified Government in writing. The notice shall summarize the basis for its decision and describe the

actions necessary to achieve compliance. If the Unified Government disagrees with any such determination, it shall invoke the dispute resolution procedures of this Consent Decree before filing any motion with the Court regarding the disagreement. However, the Unified Government shall not seek dispute resolution of any dispute regarding termination until ninety (90) days after service of its request for Termination.

XXIV. PUBLIC PARTICIPATION

118. This Consent Decree shall be lodged with the Court for a period of not less than thirty (30) days for public notice and comment in accordance with 28 C.F.R. § 50.7. The United States reserves the right to withdraw or withhold its consent if the comments regarding the Consent Decree disclose facts or considerations indicating that the Consent Decree is inappropriate, improper, or inadequate. The Unified Government hereby consents to entry of this Consent Decree without further notice.

XXV. SIGNATORIES/SERVICE

119. Each undersigned representative of the Unified Government and State and the Assistant Attorney General for the Environment and Natural Resources Division of the United States Department of Justice, certifies that he or she is fully authorized to enter into the terms and conditions of this Consent Decree and to execute and legally bind the Party he or she represents to this document.

120. This Consent Decree may be signed in counterparts, and its validity shall not be challenged on that basis.

121. The Unified Government agrees not to oppose entry of this Consent Decree by the Court or to challenge any provision of the Decree, unless the United States has notified the Unified Government in writing that it no longer supports entry of the Decree.

122. The Unified Government agrees to accept service of process by mail with respect to all matters arising under or relating to this Consent Decree and to waive the formal service requirements set forth in Rules 4 and 5 of the Federal Rules of Civil Procedure and any applicable Local Rules of this Court including, but not limited to, service of a summons.

XXVI. INTEGRATION

123. This Consent Decree and its Appendices constitute the final, complete, and exclusive agreement and understanding among the Parties with respect to the settlement embodied in the Decree and supersede all prior agreements and understandings, whether oral or written, concerning the settlement embodied herein. Other than the Appendices, which are attached to and incorporated in this Decree, and Deliverables that are subsequently submitted and approved pursuant to this Decree, no other document, nor any representation, inducement, agreement, understanding, or promise, constitutes any part of this Decree or the settlement it represents, nor shall it be used in construing the terms of this Decree.

XXVII. PARTIAL JUDGMENT

124. Upon approval and entry of this Consent Decree by the Court, this Consent Decree shall constitute a partial judgment of the Court as to the Parties. The Parties recognize that final resolution of the claims set forth in the Complaint will require further remedial action, and this Consent Decree is without prejudice to the Parties' positions as to the merits of any such further relief.

Dated and entered this ____day of _______, 2013.

____
UNITED STATES DISTRICT JUDGE
District of Kansas

WE HEREBY CONSENT to the entry of this Consent Decree in the matter of U.S. v. Unified Government of Wyandotte Co. and Kansas City, Kansas and the State of Kansas, subject to the public notice and comment provisions of 28 C.F.R. § 50.7:

FOR THE UNITED STATES OF AMERICA:

Dated: 3/19/13

Ignacia S. Moreno

IGNACIA S. MORENO
Assistant Attorney General
U.S. Department of Justice
Environment and Natural Resources Division

Dated: 3/20/13

Erika Zimmerman

ERIKA M. ZIMMERMAN
Trial Attorney
U.S. Department of Justice
Environment and Natural Resources Division
Environmental Enforcement Section
c/o NOAA, Damage Asssessment
7600 Sand Point Way, N.E.
Seattle, Washington 98115
Telephone:(206) 526-6608
Facsimile: (206) 526-6665
erika.zimmerman@usdoj.gov

WE HEREBY CONSENT to the entry of this Consent Decree in the matter of U.S. v. Unified Government of Wyandotte Co. and Kansas City, Kansas and the State of Kansas, subject to the public notice and comment provisions of 28 C.F.R. § 50.7:

FOR THE UNITED STATES OF AMERICA (Continued):

BARRY R. GRISSOM
United States Attorney
District of Kansas

Dated: 3/19/2013

DAVID ZIMMERMAN
Assistant United States Attorney
District of Kansas
500 State Ave., Suite 360
Kansas City, Kansas 66101
Telephone: (913) 551-6730
Facsimile: (913) 551-6541
D. Kan. No. 23486

WE HEREBY CONSENT to the entry of this Consent Decree in the matter of U.S. v. Unified Government of Wyandotte Co. and Kansas City, Kansas and the State of Kansas, subject to the public notice and comment provisions of 28 C.F.R. § 50.7:

FOR THE UNITED STATES OF AMERICA (Continued):

Dated: 3/7/13

KARL BROOKS
Regional Administrator
United States Environmental Protection Agency
Region 7
11201 Renner Road
Lenexa, Kansas 66219
Telephone: (913) 551-7587
Facsimile: (913) 551-9587

Dated: 3/5/2013

PATRICIA GILLISPIE MILLER
Senior Counsel
United States Environmental Protection Agency
Region 7
11201 Renner Road
Lenexa, Kansas 66219
Telephone: (913) 551-7283
Facsimile: (913) 551-9283

WE HEREBY CONSENT to the entry of this Consent Decree in the matter of U.S. v. Unified Government of Wyandotte Co. and Kansas City, Kansas and the State of Kansas, subject to the public notice and comment provisions of 28 C.F.R. § 50.7:

FOR THE UNITED STATES OF AMERICA (Continued):

Dated: March 8, 2013

MARK POLLINS
Division Director
Water Enforcement Division
Office of Civil Enforcement
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency

Dated: Feb 28, 2013

LOREN DENTON
Municipal Branch Chief
Water Enforcement Division
Office of Civil Enforcement
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency

Dated: February 21, 2013

BENJAMIN BAHK
Staff Attorney
Water Enforcement Division
Office of Civil Enforcement
Office of Enforcement and Compliance Assurance
U.S. Environmental Protection Agency

WE HEREBY CONSENT to the entry of this Consent Decree in the matter of U.S. v. Unified Government of Wyandotte Co. and Kansas City, Kansas and the State of Kansas:

FOR DEFENDANT UNIFIED GOVERNMENT OF WYANDOTTE COUNTY AND KANSAS CITY, KANSAS:

Dated: 2-28-2013

Mayor

Jody Boeding

Jody Boeding, Esq.
Misty Brown, Esq.
Legal Department
Unified Government of Wyandotte County/Kansas City, Ks
Attorneys of Record for the Unified Government

Telephone: (913) 573-5060
Facsimile: (913) 573-5243

WE HEREBY CONSENT to the entry of this Consent Decree in the matter of U.S. v. Unified Government of Wyandotte Co. and Kansas City, Kansas and the State of Kansas, subject to the public notice and comment provisions of 28 C.F.R. § 50.7:

FOR DEFENDANT THE STATE OF KANSAS:

Dated: March 15, 2013

Robert Moser

ROBERT MOSER, MD
Secretary
Kansas Department of Health and Environment

Appendix B –

Kaw Point WWTP Condition Assessment Notes (December 2015)

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
PRIMARY CLARIFIER COMPLEX							
Influent Screening							
Number	-	4	2014	1	1	Unknown	MBS looks and operates as anticipated. Guard railings on the discharge side of the screens lack rigidity. Large greaseburgs have been passed through the MBS that have knocked the rails back. Suggest modification within the next year to add stabilizing metalwork to add rigidity. Also need to address the grease issue before grease congeals into unmanageable greaseburgs. Suggest evaluation of protocol/grease removal at WWTP Influent Junction Box.
Screen media	-	Bar rack					
Opening size	inches	1/4-inch					
Cleaning mechanism	-	Multiple rake, catenary chain/link driven					
Manufacturer		Duperon					
Motor rating, each	hp						
Screening Conveying							
Number	-	1	2004	4	3	2	Moderate deterioration. Screenings are sloppy to handle. Load at time exceeds belt capacity - greaseburgs. Odor concerns with Control Room above.
Type	-	Belt conveyor					
Motor rating, each	hp						

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
Aeration - Grit Removal							
Number	-	4	1995	2	2	Unknown	Piping in tank has deteriorated (reported, not observed), but no air leaks noted at knee joints. Tank mixing was uniform. Equipment no longer supported by manufacturer. Retrofit with different diffusers as they break down. Gates are difficult to operate. Need to be rebuilt or replaced. Consider replacing with motor actuated valve and place on regular PM program.
Type	-	Aerated basins					
Length	ft	82					
Width	ft	20					
Sidewater depth	ft	16.8					
Grit Basin Blowers							
Number	-	6	1966	2	2	Unknown	Decent shape but will need replacement soon.
Type	-	multistage; center vane axial					
Capacity, each	scfm	1075 @ Y-psig discharge					
Motor rating, each	hp	50	1966	3	2	Unknown	

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
Basin Grit Collector							
Number	-	4	1980s	3	2	Unknown	Screw auger in bottom of grit chambers were made by US Filters - parts are no longer available. Staff noted all grit conveyed not pumped. Corrosion noted on exterior conveyor. Dewatered grit drops into roll off containers. Splatter is not contained. Area is very tight and prevents using forklift to move the containers. Once containers are moved into open area, forklift is used to suspend the container over the dumpster and then tilted to empty contents. Consider upgrading area to compact both the screenings and grit and transfer it to the grit dumpster. Storage area for containers is exposed to environment and fill with water when raining. Need protection to prevent water accumulation. Discharge piping hangers
Type	-	Auger screw conveyor					
Motor rating, each	hp			U	U	Unknown	
Dumpster capacity	CY	20	-	-	-	-	

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
							have pulled out of wall. During operation grit water splashed beyond boundaries of equipment.
Primary Clarifiers							
Number	-	4	2001 2002 2004 2007	2	2	1	Drives and submerged components were replaced in 2001, 2002, 2004, and 2007. Corner sweeps are ineffective consider removing the sweeping and adding concrete fillet to prevent sludge accumulation. Gates do not seal well - repair and replace with actuators. Some leaks in the floors.
Type	-	Circle, center-feed, inboard double-sided weir effluent launders					
Length	ft	105					
Width	ft	105					
Sidewater depth	ft	8.17					
Center column diameter	in	52					
Number of CC ports	-	4					
CC port width	in						
CC port height	in						
EDI type	-	Tangential scoop					
EDI diameter	ft	11					
EDI depth	ft	2.5					
Number of EDI ports	-	8					
EDI port width	in						
EDI port height	in						
Feedwell diameter	ft	26					
Feedwell depth	ft	4					
Number of scum ports	-	8					

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
Sludge collector type	-	Spiral rake scrapers with corner sweeps					
Motor rating, each	hp	0.75					
Scum collector type		Tangential skimmers with peripheral beaching trough inboard of effluent trough. Scum baffle on inboard side of effluent launder					
Effluent launder type		Inboard, double-sided v-notch weir					
Primary Sludge Pumping							
Number	-	4	1995	3	3	2	Did not observe while running. Noted that one pump was supported by temporary braces indicating a vibration problem may exist. Replacement parts are difficult to obtain. Pump slated for replacement in 2016 - 2017. Primary sludge pump used to empty scum pit. Water seeping into basement.
Type	-	Peristaltic hose pumps					
Capacity, each	gpm	224 @ full speed					
Motor rating, each	hp						

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
Other Primary Clarifier Building Comments							
Stairs/Landings Around Screening		fiberglass guardrail and metal grating	1980s	3	3	3	Observed guardrail that needs replaced and walkway grating damage.
Walkway to Oxygenation Basins Roof			?	3	5	-	Roof leaks.
Sump Pump				4	4	-	Replace pumps and controls.
Building Exterior Paint			2012	1	-	-	
Primary Sludge Flow Meters			2010	1	1	2	
Influent Flow Meter		transducer in-pipe	2012	1	1	2	
Ventilation							Corrosion concerns.
Oxygenation Basins							
Number	-	4	2005	2	1	2	Effluent gate actuators do not work, shafts bent, takes two persons to operate. Drain pumps modified recently but still problematic. Mud valve drainage issues. LEL system gives inaccurate measurements appears to be very heat sensitive. DO probes need to be replaced soon. Control room floor and air condition bad, replace.
Type	-	4 covered complete mix cells in series					
		Cell 1A					
Length, each	ft	44					
Width, each	ft	44					
Sidewater depth	ft	14.87					
Aeration type	-	High purity oxygen, surface aerator mixers with draft tubes 123 hp					

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
Influent Flow Meters	4	Magnetic meters					Butterfly isolation valves difficult to manually close, safety issue for staff (stand on top of pipe).
Effluent Flow Meters	4	Magnetic meters	1985	3	4	2	
Oxygenation Building							
Oxygen Storage System			2009	2	1	3	Staff indicated capacity an issue only during peak demand, but they have made some recent pressure setpoint adjustments to account for this. Consider onsite generation backup.
Secondary Clarifiers							
Number	-	4	2007 rehab	3	3	4	Clarifier drives & submerged surfaces replaced within last 8 years Staff indicated FC2 requires 2 RAS pumps to maintain process at all times. Consider evaluating FC2 differences. Hydraulic issues at high flows limit capacity and require operational adjustments for scum removal. Building requires updates to HVAC and lighting. >Riser suction assembly
Type	-	Circular center-feed					
Diameter	ft	120					
Sidewater depth	ft	15.36					
Center water depth	ft	20.36					
Center column diameter	in						

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
							should be replaced; tubes are difficult to adjust and may impact RAS performance.
Number of CC ports	-						Weir/Baffle plate level and location inconsistencies such that launder covers do not always cover them. Periodic dense, sticky foam is discharged to the plant and travels to the secondary clarifiers. Need to identify the source to treat at origin and\or to incorporate a foam removal system that captures the foam prior to reaching the final clarifiers. Foam freezes in winter. DO probes are difficult to maintain. Consider replacing units and selecting a better control location that is easier to maintain. Scum skimmer flaps do not maintain contact with scum weir. The clarifier number 2 seems to hold more foam than other
CC port width	in						
CC port height	in						
EDI type	-	none					
EDI diameter	ft	none					
EDI depth	ft	none					
Number of EDI ports	-	none					
EDI port width	in	none					
EDI port height	in	none					
Feedwell diameter	ft						
Feedwell depth	ft						
Number of scum ports	-						
Sludge collector type	-	Riser suction tubes to RAS box					
Motor rating, each	hp						
Scum collector type		Two skimmers with peripheral beaching trough inboard of effluent trough. Scum baffle on inboard side of effluent launder.					

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
Effluent launder type		Inboard, double-sided v-notch weir					units.
FINAL CLARIFIER COMPLEX							
RAS Pumping							
Number	-	8	2007	2	3	U	RAS Pumps are limited in efficient sludge withdrawal. Need to check capacity vs required pumping. Consider replacing VFDs
Type	-	Horizontal centrifugal					
Capacity, each	gpm	3000 @ 16-ft TDH 2430 @ 23-ft TDH					
Motor rating, each	hp	20					
WAS Pumping							
Number	-	2	1985				WAS Pumps, four were replaced in 2007, 2 more need to be replaced. Staff indicated density meters on system do not work.
Type	-	Horizontal centrifugal					
Capacity, each	gpm	450 @ Y-ft TDH					
Motor rating, each	hp	50					
Number	-	4	2007				WAS Pumps, four were replaced in 2007, 2 more need to be replaced.
Type	-	Progressing cavity					
Capacity, each	gpm	400 @ 69.3-ft TDH					
Motor rating, each	hp	25					
Secondary Clarifier Scum Pumping							
Number	-	4					Scum Pump scheduled for replacement in 2015 - 2016, scum pump operation is not automated, Consider updating controls with replacement project. Current pumps are
Type	-	Double diaphragm disc					
Capacity, each	gpm	176 @ 76-ft TDH					
Motor rating, each	hp	7.5					

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
							difficult to get replacement parts. Consider adding piping to redirect clear waterway from sludge treatment.
Other Final Complex Items							
TWAS Pumps		2, prog cavity, 20 hp, 150 gpm @ 138.6 ft TDH					Sludge pumps leak a lot.
Gravity Belt Thickeners			2007				Feed chutes deteriorate rapidly and require frequent replacement.
Polymer System		tote system, tanks in basement	2007				Polymer system would be improved by incorporating aging and mixing systems.
Sump Pumps							Admin Sump Pumps do not work when heavy grease accumulates in Influent Vault.
Other							> Need improved water pressure/washing in basement. > Insufficient water for cleaning > Climate controls are very poor - either hot or cold.
UV Disinfection							
Number of channels	-	3	2014	1	2	2	Staff indicated periodic issues with flow meter breakdown;

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
Channel width	ft	29.58					requested additional method to bring tools into FM vault. Staff indicated concerns with use of the Kansas River Gate and discussed plans to extend the outfall to the Missouri River.
Channel length	ft	6					
Channel SWD	ft	8.17 (wall depth, not water depth; water depth 2.27 ft)					
Banks per channel	-	2					
Bulbs per bank	-	192					
Type of bulb	-	low pressure, high intensity amalgam lamp					
Digester Complex/Sludge Storage							
Storage Tanks	4	concrete					Per staff, tanks leak, lining coming off. Add at grade access to the tanks.
Sludge Recirc/Mixing Pumps			1995	4	5	4	Staff indicated mixing issues, 4 pumps have been removed and pumps to tanks 1 & 3 have the old Fairbanks Pumps. Pumps currently used to transfer solids between tanks as well.

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
Elevator	1		original equipment	4	5	-	Staff indicated that the elevator frequently does not work and can lock staff in/out.
Floor Drainage							Observed running water directed to floor drain that was overwhelmed and leaked into the basement. Observed solids and water accumulation in basement.
Centrifuge Feed Pumps							
Number of Pumps	-	4	3 older; one added 2016				One pump added in the new Solids Thickening Building project currently in progress; other 3 pumps are old
Type	-	Progressing Cavity					
Capacity	gpm						
Drive motor	hp						
Solids Dewatering Building - 2015/2016 project in progress							
Polymer Storage Tanks							
Chemical Service	-	Neat Emulsion Polymer	2016	1	1	2	
Number of tanks	-	2, flat top					
Chemical Concentration	% by weight	35					
Usable Capacity	gal	4,000					
Diameter	ft	8					
Straight sheel length/height	ft	11.5					
Polymer Aging Tanks							

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
Chemical Service		Emulsion Polymer Solution	2016	1	1	2	
Number of Tanks		2, flat top					
Polymer Concentration	% by vol (as neat polymer)	0.5-1.0					
Usable Capacity	gal	5,000					
Tank Diameter	ft	8					
Straight sheel length/height	ft	14.5					
Polymer Recirculation Pumps							
Number of Pumps	-	2	2016	1	1	2	
Type	-	Progressing Cavity					
Capacity	gpm	52 @ 1770 rpm & 60 psi					
Drive motor	hp	7.5 hp					
Polymer feeder/blenders							
Number of Pumps	-	2	2016	1	1	2	
Dilution Water Flow Range	gpm	21 - 210					
Polymer Flow Range	gph	4.25 - 85 @ 1750 rpm & 40 psi					
Drive motor hp	hp	1 hp					
Polymer Metering Pumps							
Number of Pumps	-	4	2016	1	1	2	
Type	-	Progressing Cavity					

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
Metering range, gpm	gpm	6.8 - 52.3 @ 1750 rpm & 60 psi					
Drive motor, hp	hp	1					
Centrifuges							
Number	-	4	2016	1	1	2	
Bowl diameter	in	22.5					
Cylinder length	in	69					
Operating Bowl Speed	rpm	3100					
Connected horsepower	hp	95					
Polymer dose	lb active/dt	15					
Cake Solids	% TS	28					
Capture Rate	%	95					
Other Plant Concerns							
Lighting							Lighting around the plant needs replacement
Security Gates							Plant indicated concern with padlocks at gates. Gates are bent which allows unauthorized persons into the plant.
Potable Water							Staff observed that potable water in the plant is believed to have a failure/cross connect that makes it

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
							unsuitable for potable use.
Communications System							Many in plant phones do not work. A paging system would be more effective.
Admin Building							> Acoustics in the room are terrible. Sound, like the rail traffic, disrupt work. > Roof dates back to 1978 and needs to be replaced. > Storage Room (old Lab) leaks when it rains. > In general, the whole building needs a refresh.
Electrical Equipment							
General- Arc Flash Analysis							Recommend system wide arc flash study analysis for electrical safety labeling.
General- Site Security							Overall safety at the plant is a concern. Gates need to be replaced, security camera's need to be added, and locks need to be replaced.

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
General- Control Room							New control room near the gate should be constructed.
General - Streets							The plant is looking to expand solids processing by taking sludge from KC Mo plant. This requires heavy semi-trailer use on the perimeter roads. This new use may require premature replacement. Preliminary evaluation indicates 40 trucks/week for Kaw Point Solids and 70 trucks/week if Westside solids are added.
Admin Bldg.							
Switchgear	n/a	n/a	~1978	U	unknown	unknown	Not viewable.
Primary Control Room							
MCC 3CA	7	480V MCC	1978	3	unknown	unknown	Mild Rusting on exterior. Equipment located in office area.
MCC C2	7	480V MCC	1978	3	unknown	unknown	Mild Rusting on exterior. Equipment located in office area.
MCC C3D	6	480V MCC	2006	2	unknown	unknown	
MCC C5	6	480V MCC	2006	2	unknown	unknown	
Digester Complex							
Outdoor Substation	1	750kVA xfmr and	~1978	4	unknown	unknown	Significant rusting.

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
		SWBD dist panel					
MCC D2	6	480V MCC	1978	5	unknown	unknown	Significant rusting. Unsafe conditions including standing water on the floor and located in a classified space. Equipment should be relocated.
MCC D3A	8	480V MCC	~2000	5	unknown	unknown	Significant rusting. Unsafe conditions including standing water on the floor and located in a classified space. Equipment should be relocated.
Utili-trol MCC	5	480V MCC	~1970	5	unknown	unknown	Significant rusting. Unsafe conditions including standing water on the floor and located in a classified space. Equipment should be relocated.
Sludge Pump VFD's	8	480V VFD	unknown	3	unknown	unknown	In decent condition but will deteriorate quickly in the corrosive environment.

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
General	n/a	Code Violations			unknown		Building needs to be completely electrically rehabbed. Equipment and conduit systems not designed for classified space.
Primary Building Switchgear and Outdoor Service Entrance Equipment							
Primary Bldg. Switchgear	unknow n		~1960s	4	4	unknown	Equipment is not reliable and old. Needs replacement soon. ATS function does not work consistently.
Outdoor substations	4	XFMR with SWBD dist panel	~1978	3	unknown	unknown	Equipment in decent condition but nearing end of useful life
LV ATS Substation	2	(2) XFMR with M-T-M LV switchgear	unknown	2	unknown	unknown	Appears in good shape.
MV Service Entrance Switchgear	6	MV fused switches	unknown	2	unknown	unknown	Appears in good shape.
Oxygen Building							
MCC-1	6	480V MCC	~2000's	2	unknown	unknown	Appears in good shape.
Outdoor Substation	2	2000 kva XFMR with LV MCC	~1980's	3	unknown	unknown	
Final Clarifier, RAS/WAS							
MCC-F1,F2	12	480V MCC	~1980's	4	unknown	unknown	Mild rust, appears to be some non-functioning buckers.
Outdoor Substation	2	2000 kva XFMR with LV MCC	~1980's	3	unknown	unknown	

Kaw Point WWTP Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
MCC-F3,4	10	480V MCC	2007	2	unknown	unknown	Appears in good shape.

[1]Condition Rating based on a scale of 1: New or Excellent Condition to 5: Virtually Unserviceable. “U” = Unknown.
[2]Reliability Rating based on a scale of 1: Failure Not Anticipated to 5: Continuous Breakdown.
[3]Capacity Rating based on a scale of 1: Exceeds Required Capacity to 5: Out of Service.

Appendix C –

Plant 20 Condition Assessment Notes (December 2015)

Plant 20 Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes	
Influent Screening (AquaGuard - 10 mgd)								
Number	-	1	1990	5	3	3	• Screening channel has significant pitting/deterioration. • Operator reported periodic control issues. • Control enclosures do not appear to be appropriate for the area classification.	
Screen media	-	bars						
Opening size	mm	15						
Cleaning mechanism	-							
Manufacturer		Parkson						
Motor rating, each	hp	3/4						
Controls				3	4			
Influent Screening (MEVA Step Screen - 7 mgd)								
Number	-	1	2001	4	3	2	• MEVA step screen has two lower broken steps, which allow rags/debris to pass through the screen. • Screening channel has significant pitting/deterioration. • Control enclosures do not appear to be appropriate for the area classification.	
Screen media	-	bars						
Opening size	inches	0.24						
Cleaning mechanism	-	moving step						
Manufacturer		Parkson						
Brake Motor rating, each	hp	3						
Controls				3	2			
Screening Other								
Belt Conveyor			1979	5	4	2	• Conveyor belt is misaligned and rollers are deteriorated. • It was reported that the gate seals have deteriorated and do not adequately seal the channel when closed.	
Channel Isolation Gates			1979	3	1	1		
Grit Removal (Total Capacity - 24 mgd)								
Number	-	2						
Type	-	vortex						
Radius	ft	6'-9"						
Sidewater depth	ft							
North Basin			1995	4	4	1		
South Basin			1995	4	U	1		

Plant 20 Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes	
Basin Grit Slurry Pumps								
Number	-	2					• Staff reported issues with pump freezing and has constructed tarp lined housing around each pump for protection from the weather.	
Type	-	top mounted turbo pump						
Capacity, each	gpm							
Motor rating, each	hp							
North Basin			1995	3	5	2		
South Basin			1995	3	5	2		
Controls				3	2			
Grit Classifier								
Number	-		1995	2	2	2	• Classifier is exposed and provides minimal organic separation and dewatering of the grit.	
Type	-							
Primary Clarifiers								
Number	-	2					• Weir has leaks at multiple locations and is deteriorated (north primary clarifier). • Clarifier drives are in good condition (north primary clarifier). • Weir has leaks at multiple locations and is deteriorated (south primary clarifier). • Clarifier drives are in good condition (south primary clarifier). • Controls and enclosures are serviceable.	
Type	-	circular						
Diameter	ft	85						
Sidewater depth	ft	10.5						
Sludge Collector Type	-	Scraper						
Scum Collector Type	-	Beach						
Weir Type	-	Double Sided V-notch						
HLR @ 7 mgd	gpd/sf	617						
Weir Loading Rate @ 7 mgd	gpd/sf	6,972						
Motor rating, each	hp							
North			1979	4	2	2		
South			1979	4	2	2		
Controls				2	2			
Primary Sludge Pumping								
Number	-						• Pump plugs with rags due to poor influent screening during high flows (north). • Mag meter has failed (north). • Influent piping, valves, and meters show signs of deterioration (north).	
Type	-							
Capacity, each	gpm							

Plant 20 Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
Motor rating, each	hp						• Influent piping, valves, and meters show signs of deterioration (south).
North			1979	3	3	2	• Controls and enclosures are serviceable.
South			1979	3	3	2	
Controls				3	3		
Primary Clarifier Scum Pumping							
Number	-						• Air lines have failed and are no longer in service.
Type	-						• Controls and enclosures are serviceable.
North				5	5	5	
South				5	5	5	
Aeration Basins							
Number	-	2					• Air flow meters are aged and in poor condition and require frequent maintenance.
Length, each	ft	70					• DO probes are in good condition.
Width, each	ft	70					
Sidewater depth	ft	20					
Aeration Type	-	Diffused, Fine Bubble					
Diffuser Type	-	Sanitaire disc, 9" dia.					
Number of Diffusers	-	2,114					
North			2001, Equipment	2	2	2	
South			2001, Equipment	2	2	2	
Instrumentation				3	3		
Blowers							
Number	-						• Controls are serviceable.
Capacity	cfm	10,000					• HMI is missing for Turblex blower.
Aeration Blowers			Mix	2	3	2	• Blower room louver is clogged with debris.
Digester Blowers			1979	2	3	2	
Controls				2	2		
Secondary Clarifiers							
Number	-	2					• Sweeps have issues and cause sheer pins to break (north and south clarifier).
Type	-	circular					• Drives are not original, but do not appear to be a maintenance issue (north and south clarifier).
Diameter	ft	90					• Controls and electrical components are serviceable.
Sidewater depth	ft	12					

Plant 20 Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes	
Sludge Collector Type	-	Scraper						
Scum Collector Type	-	Beach						
Weir Type	-	Double Sided V-notch						
Motor rating, each	hp							
North			1979	3	4	2		
North Drive				2	3			
South			1979	3	4	2		
South Drive				2	3			
Controls				2	2			
RAS Pumping								
Number	-		1979	2	2	2	• Pumps have been rebuilt, but not recently. • Piping is deteriorating.	
Type	-							
Capacity, each	gpm							
Motor rating, each	hp							
Instrumentation				4	4			
Controls				3	3			
WAS Pumping								
Number	-		1995	4	5	3	• WAS pumps were installed in 1990. • Piping is deteriorating. • Staff reported issues with screw type impellers.	
Type	-							
Capacity, each	gpm							
Motor rating, each	hp							
Instrumentation				4	4			
Controls				3	3			
Digested Sludge Pumping								
Number	-							
Type	-							
Capacity, each	gpm							
Motor rating, each	hp							
North			1979	4	4	3		
South			1979	3	2	3		
Controls				3	3			
Secondary Clarifier Scum Pumping								
Number	-		2001	2	3	2		
Type	-							
Capacity, each	gpm							
Motor rating, each	hp							

Plant 20 Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes	
Primary and Secondary Splitter Boxes								
Primary			1979	2	2	2		
Secondary			1979	2	2	2		
UV Disinfection								
Number of channels	-	3 total (2 in service, 1 future)					• Modules are reported to have been repeatedly flooded due to inadequate level control by the downstream weighted gate. • Influent flow distribution between channels is not optimal. • Consistent communication failures (controls). • Air valve solenoid valves and conduit fittings have corroded (controls). • Air scour blower controls are serviceable (controls).	
Channel width	ft	2						
Channel length	ft							
Channel side water depth	ft							
Modules per channel	-	5						
Max modules per channel	-	7						
Bulbs per bank	-							
Type of bulb	-							
Equipment				3	4	2		
Controls				3	5			
Effluent Meter Vault								
Facility			1979				• Poor access and high headloss across meter.	
Instrumentation				5	5	5		
Aerobic Digester								
Air Tube System			1979	4	4	2	• Electrical raceway and support components are mild steel material and extremely corroded. • Control enclosures are extremely corroded. • North and south digested sludge pump was installed in 1979. • North and south digested sludge pump mag meter no longer works.	
Electrical				5	4	4		
Controls				4	4	4		
Primary Sludge Gravity Thickener								
Mechanism			1979	4	3		• Metal walkway is rusted through. • Effluent pipe is reported to be under vacuum condition. • Conduit and control enclosures are corroded.	
Instrumentation				4	4			
Electrical				4	4			

Plant 20 Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating[1]	Reliability Rating[2]	Capacity Rating[3]	Notes
Controls				3	3		
Digested and Overflow Sludge Gravity Thickeners							
Flygt Mixer			2001	2	2	2	• Mixer has issues with rags. • Sections of conduit are corroded (controls).
Basins			1979				
Instrumentation				U	U	U	
Electrical				4	4		
Controls				3	3		
Belt Filter Press							
Parkson			2001	3	3	3	• Controls are dated but serviceable.
Polymer System			2014	1	1	1	
Screw Cake Conveyor			2010	2	3	2	
Cake Pump			2010	2	3	2	
Filtrate Pumps (North and South)			2001	2	3	2	
Primary Sludge Transfer Pump (North)	Moyno		2010	3	2	2	
Primary Sludge Transfer Pump (South)	Seepex		2014	2	2	2	
Press Feed Pumps (North and South)	Moyno		2001	2	3	2	
Electrical (all)				3	3	2	
Controls (all)				3	3		
Odor Control, HVAC							
Blower Room Louver				U	U	U	
East Utility Transformer							
General Electric Oil Filled; 1500KVA, 3PH, 13.2/0.48-.277KV, Wye-Wye			1985/2003	3	3	2	• Transformers are approximately 30 years old.
Mfg:1985/Reman: 2003							
Age:30/13 Since Reman							
Xfmr Pads/Yard							

Plant 20 Condition Assessment Notes (December 2015)

Process, Structure, or Equipment	Units	Value	Installation Date	Condition Rating¹	Reliability Rating²	Capacity Rating³	Notes
East Utility Transformer							
Central Moloney Inc Oil Filled; 1500KVA, 3PH, 12.47/0.48-.277KV, Wye-Wye Mfg in 1975/Reman: 2000 Age:40/16 Since Reman Xfmr Pads/Yard			1975/2000	3	3	2	
Electrical Distribution Equipment							
Main Switchboard (P&B)			2003	2	1	2	• Equipment is in new condition with significant service life remaining.
MCC1 (Head Works)			1975	5	5	3	• MCC1 is original to the plant and beyond expected useful life.
MCC2 (Head Works)			1975	5	5	3	• MCC2 is original to the plant and beyond expected useful life.
MCC3 (Pump & Blwr)			1975	5	5	3	• MCC3 is original to the plant and beyond expected useful life.
MCC4 (Pump & Blwr)			1975	5	5	3	• MCC4 is original to the plant and beyond expected useful life.
MCC5 (Pump & Blwr)			1975	5	5	3	• MCC5 is original to the plant and beyond expected useful life.
MCC6 (Final Solids)			2001	2	1	2	• MCC6 is in good, serviceable condition.
MCC7 (Admin)			U	4	4	3	• MCC7 is original to the plant and beyond expected useful life.
SCADA System							
Alan Bradley SLC 5/05 PLC based distributed control system			2000	2	2	3	

¹Condition Rating based on a scale of 1: New or Excellent Condition to 5: Virtually Unserviceable. "U" = Unknown.
²Reliability Rating based on a scale of 1: Failure Not Anticipated to 5: Continuous Breakdown.
³Capacity Rating based on a scale of 1: Exceeds Required Capacity to 5: Out of Service.

Appendix D –
Financial Model Scenarios

Table 1
Scenario A1
Unified Government of Wyandotte County / Kansas City, KS
4.51% of Projected MHI in Year 25 (2040)
$1,216,503,400
2016 - 2040

Line No.		Year 1 2016 ($)	Year 2 2017 ($)	Year 3 2018 ($)	Year 4 2019 ($)	Year 5 2020 ($)	Year 6 2021 ($)	Year 7 2022 ($)	Year 8 2023 ($)	Year 9 2024 ($)	Year 10 2025 ($)
Capital Plan by Funding Source											
1	Total CIP	$21,618,000	$21,864,800	$37,802,000	$31,347,100	$24,463,000	$24,088,500	$32,222,700	$19,931,300	$23,877,300	$21,946,200
2	Sewer Cash Funded	$9,268,000	$10,900,000	$6,600,000	$8,000,000	$6,800,000	$4,800,000	$4,500,000	$4,100,000	$2,500,000	$3,300,000
3	Stormwater Cash Funded	$2,200,000	$1,200,000	$850,000	$800,000	$850,000	$800,000	$650,000	$400,000	$500,000	$200,000
4	Total Cash Funded CIP	$11,468,000	$12,100,000	$7,450,000	$8,800,000	$7,650,000	$5,600,000	$5,150,000	$4,500,000	$3,000,000	$3,500,000
5	Sewer Debt Funded	$6,300,000	$6,175,300	$26,873,500	$20,265,600	$12,992,100	$13,550,100	$25,036,100	$9,989,400	$18,527,100	$15,710,500
6	Stormwater Debt Funded	$3,850,000	$3,589,500	$3,478,500	$2,281,500	$3,820,900	$4,938,400	$2,036,600	$5,441,900	$2,350,200	$2,735,700
7	Total Debt Funded CIP	$10,150,000	$9,764,800	$30,352,000	$22,547,100	$16,813,000	$18,488,500	$27,072,700	$15,431,300	$20,877,300	$18,446,200
8	Total CIP	$21,618,000	$21,864,800	$37,802,000	$31,347,100	$24,463,000	$24,088,500	$32,222,700	$19,931,300	$23,877,300	$21,946,200
9	Total Wastewater CIP	$15,568,000	$17,075,300	$33,473,500	$28,265,600	$19,792,100	$18,350,100	$29,536,100	$14,089,400	$21,027,100	$19,010,500
10	Stormwater CIP	$6,050,000	$4,789,500	$4,328,500	$3,081,500	$4,670,900	$5,738,400	$2,686,600	$5,841,900	$2,850,200	$2,935,700
11	Total CIP	$21,618,000	$21,864,800	$37,802,000	$31,347,100	$24,463,000	$24,088,500	$32,222,700	$19,931,300	$23,877,300	$21,946,200
12	NPV of CIP	$794,103,500									
Revenue Increases											
13	Proposed Percentage Revenue Increases for Wastewater	7.0%	7.0%	6.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.0%	3.0%
14	Proposed Percentage Revenue Increases for Stormwater	0.0%	0.0%	7.0%	7.0%	7.0%	6.0%	5.0%	5.0%	5.0%	5.0%
Affordability [1]											
15	Average Wastewater Bill per Month [2]	36.73	39.32	41.71	43.40	45.12	46.50	47.91	49.32	50.81	52.32
16	Average Stormwater Bill per Month	4.50	4.50	4.82	5.16	5.52	5.85	6.14	6.45	6.77	7.11
17	Total Combined Monthly Bill	41.23	43.82	46.53	48.56	50.64	52.35	54.05	55.77	57.58	59.43
18	Median Household Income [3]	$35,724	$35,724	$35,724	$35,724	$35,724	$36,081	$36,442	$36,806	$37,174	$37,546
19	**Average Annual Wastewater and Stormwater Bill as a Percent of MHI**	**1.38%**	**1.47%**	**1.56%**	**1.63%**	**1.70%**	**1.74%**	**1.78%**	**1.82%**	**1.86%**	**1.90%**
Debt											
20	Sewer Debt as a Percentage of Revenue [4]	21%	23%	23%	21%	25%	28%	30%	31%	35%	34%
21	Annual Sewer Debt Service Principal & Interest Payments	6,987,300	8,013,700	8,360,300	8,027,900	9,994,300	11,632,800	12,723,000	13,764,700	15,840,700	15,932,100
22	Debt Service Coverage Ratio	2.6	2.3	2.4	2.6	2.2	1.9	1.8	1.7	1.5	1.5
23	Stormwater Debt as a Percentage of Revenue [4]	33%	33%	40%	45%	48%	50%	54%	61%	61%	67%
24	Annual Stormwater Debt Service Principal & Interest Payr	1,103,100	1,101,900	1,397,400	1,681,900	1,953,800	2,142,500	2,461,200	2,891,600	3,059,100	3,526,900
25	Debt Service Coverage Ratio	2.2	2.2	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2
26	Total Debt as a Percentage of Revenue [4]	22%	24%	24%	23%	27%	30%	32%	34%	37%	37%
27	Annual Total Debt Service Principal & Interest Payments	$8,090,400	$9,115,600	$9,757,700	$9,709,800	$11,948,100	$13,775,300	$15,184,200	$16,656,300	$18,899,800	$19,459,000
28	Debt Service Coverage Ratio	2.5	2.3	2.3	2.5	2.1	1.8	1.7	1.6	1.5	1.5

Line No.		Year 11 2026 ($)	Year 12 2027 ($)	Year 13 2028 ($)	Year 14 2029 ($)	Year 15 2030 ($)	Year 16 2031 ($)	Year 17 2032 ($)	Year 18 2033 ($)	Year 19 2034 ($)	Year 20 2035 ($)	Year 21 2036 ($)	Year 22 2037 ($)	Year 23 2038 ($)	Year 24 2039 ($)	Year 25 2040 ($)
Capital Plan by Funding Source																
1	Total CIP	$13,185,200	$23,447,500	$26,981,100	$27,454,200	$19,885,900	$67,270,000	$162,513,000	$132,404,700	$43,329,700	$80,675,600	$133,596,400	$97,788,000	$61,672,100	$19,039,200	$48,099,900
2	Sewer Cash Funded	$4,000,000	$5,600,000	$8,200,000	$10,500,000	$12,900,000	$17,300,000	$20,500,000	$21,900,000	$15,600,000	$14,100,000	$21,700,000	$23,600,000	$21,500,000	$14,697,300	$31,000,000
3	Stormwater Cash Funded	$350,000	$450,000	$600,000	$650,000	$750,000	$900,000	$950,000	$950,000	$1,350,000	$1,500,000	$1,800,000	$1,700,000	$2,000,000	$2,250,000	$2,450,000
4	Total Cash Funded CIP	$4,350,000	$6,050,000	$8,800,000	$11,150,000	$13,650,000	$18,200,000	$21,450,000	$22,850,000	$16,950,000	$15,600,000	$23,500,000	$25,300,000	$23,500,000	$16,947,300	$33,450,000
5	Sewer Debt Funded	$6,161,400	$14,733,000	$15,573,100	$13,650,000	$3,658,200	$46,542,500	$138,482,600	$106,868,400	$23,984,300	$62,717,900	$107,923,000	$70,095,400	$35,956,700	$0	$12,627,800
6	Stormwater Debt Funded	$2,673,800	$2,664,500	$2,608,000	$2,654,200	$2,577,700	$2,527,500	$2,580,400	$2,686,300	$2,395,400	$2,357,700	$2,173,400	$2,392,600	$2,215,400	$2,091,900	$2,022,100
7	Total Debt Funded CIP	$8,835,200	$17,397,500	$18,181,100	$16,304,200	$6,235,900	$49,070,000	$141,063,000	$109,554,700	$26,379,700	$65,075,600	$110,096,400	$72,488,000	$38,172,100	$2,091,900	$14,649,900
8	Total CIP	$13,185,200	$23,447,500	$26,981,100	$27,454,200	$19,885,900	$67,270,000	$162,513,000	$132,404,700	$43,329,700	$80,675,600	$133,596,400	$97,788,000	$61,672,100	$19,039,200	$48,099,900
9	Total Wastewater CIP	$10,161,400	$20,333,000	$23,773,100	$24,150,000	$16,558,200	$63,842,500	$158,982,600	$128,768,400	$39,584,300	$76,817,900	$129,623,000	$93,695,400	$57,456,700	$14,697,300	$43,627,800
10	Stormwater CIP	$3,023,800	$3,114,500	$3,208,000	$3,304,200	$3,327,700	$3,427,500	$3,530,400	$3,636,300	$3,745,400	$3,857,700	$3,973,400	$4,092,600	$4,215,400	$4,341,900	$4,472,100
11	Total CIP	$13,185,200	$23,447,500	$26,981,100	$27,454,200	$19,885,900	$67,270,000	$162,513,000	$132,404,700	$43,329,700	$80,675,600	$133,596,400	$97,788,000	$61,672,100	$19,039,200	$48,099,900
12	NPV of CIP															
Revenue Increases																
13	Proposed Percentage Revenue Increases for Wastewater	8.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	9.0%	9.0%	9.0%	9.0%	9.0%	7.0%	5.0%	4.0%
14	Proposed Percentage Revenue Increases for Stormwater	7.0%	7.0%	7.0%	5.0%	5.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.0%	2.0%	2.0%	2.0%
Affordability [1]																
15	Average Wastewater Bill per Month [2]	56.52	60.46	64.68	69.20	74.03	79.23	84.76	92.39	100.70	109.74	119.59	130.34	139.47	146.47	152.31
16	Average Stormwater Bill per Month	7.61	8.14	8.71	9.15	9.61	9.90	10.20	10.51	10.83	11.15	11.48	11.48	11.48	11.48	11.48
17	Total Combined Monthly Bill	64.13	68.60	73.39	78.35	83.64	89.13	94.96	102.90	111.53	120.89	131.07	141.82	150.95	157.95	163.79
18	Median Household Income [3]	$37,921	$38,300	$38,683	$39,070	$39,461	$39,856	$40,255	$40,658	$41,065	$41,476	$41,891	$42,310	$42,733	$43,160	$43,592
19	**Average Annual Wastewater and Stormwater Bill as a Percent of MHI**	**2.03%**	**2.15%**	**2.28%**	**2.41%**	**2.54%**	**2.68%**	**2.83%**	**3.04%**	**3.26%**	**3.50%**	**3.75%**	**4.02%**	**4.24%**	**4.39%**	**4.51%**
Debt																
20	Sewer Debt as a Percentage of Revenue [4]	35%	35%	33%	33%	32%	29%	27%	29%	40%	45%	41%	42%	46%	48%	47%
21	Annual Sewer Debt Service Principal & Interest Payments	17,516,600	18,849,200	19,283,000	20,177,600	21,316,800	20,684,900	20,896,500	24,414,800	36,151,900	44,375,300	44,502,700	49,858,000	58,589,600	64,090,400	65,006,600
22	Debt Service Coverage Ratio	1.5	1.6	1.7	1.8	1.8	2.1	2.2	2.1	1.6	1.5	1.6	1.6	1.5	1.5	1.5
23	Stormwater Debt as a Percentage of Revenue [4]	66%	66%	65%	65%	64%	63%	63%	63%	59%	58%	55%	56%	54%	52%	50%
24	Annual Stormwater Debt Service Principal & Interest Payr	3,738,000	3,971,500	4,205,300	4,431,900	4,649,400	4,748,600	4,872,000	5,040,100	4,893,000	4,941,800	4,852,000	5,053,300	4,943,400	4,866,100	4,776,500
25	Debt Service Coverage Ratio	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.5	1.4	1.5	1.6	1.6
26	Total Debt as a Percentage of Revenue [4]	38%	38%	37%	36%	35%	32%	31%	32%	42%	46%	42%	43%	47%	48%	47%
27	Annual Total Debt Service Principal & Interest Payments	$21,254,600	$22,820,700	$23,488,300	$24,609,500	$25,966,200	$25,433,500	$25,768,500	$29,454,900	$41,044,900	$49,317,100	$49,354,700	$54,911,300	$63,533,000	$68,956,500	$69,783,100
28	Debt Service Coverage Ratio	1.5	1.5	1.6	1.7	1.7	1.9	2.1	2.0	1.6	1.5	1.6	1.6	1.5	1.5	1.5

[1] Rate projections are estimates and are not represented to be affordable.
[2] Wastewater bills are based on average volume of 5.6 ccf per month.
[3] 2014 MHI of $35,724 held constant through 2020, then inflated each year by 1 percent.
[4] Total Annual Debt Service divided by Annual Revenues

Table 1
Scenario A2
Unified Government of Wyandotte County / Kansas City, KS
4.68% of Projected MHI in Year 25 (2040)
$1,444,251,600
2016 - 2040

Line No.		Year 1 2016 ($)	Year 2 2017 ($)	Year 3 2018 ($)	Year 4 2019 ($)	Year 5 2020 ($)	Year 6 2021 ($)	Year 7 2022 ($)	Year 8 2023 ($)	Year 9 2024 ($)	Year 10 2025 ($)
	Capital Plan by Funding Source										
1	Total CIP	$21,618,000	$21,864,800	$37,802,000	$31,347,100	$24,463,000	$24,088,500	$32,222,700	$19,931,300	$23,877,300	$21,946,200
2	Sewer Cash Funded	$9,268,000	$10,900,000	$6,600,000	$8,000,000	$6,800,000	$4,800,000	$4,500,000	$4,100,000	$2,500,000	$3,300,000
3	Stormwater Cash Funded	$2,200,000	$1,200,000	$850,000	$800,000	$850,000	$800,000	$650,000	$400,000	$500,000	$200,000
4	Total Cash Funded CIP	$11,468,000	$12,100,000	$7,450,000	$8,800,000	$7,650,000	$5,600,000	$5,150,000	$4,500,000	$3,000,000	$3,500,000
5	Sewer Debt Funded	$6,300,000	$6,175,300	$26,873,500	$20,265,600	$12,992,100	$13,550,100	$25,036,100	$9,989,400	$18,527,100	$15,710,500
6	Stormwater Debt Funded	$3,850,000	$3,589,500	$3,478,500	$2,281,500	$3,820,900	$4,938,400	$2,036,600	$5,441,900	$2,350,200	$2,735,700
7	Total Debt Funded CIP	$10,150,000	$9,764,800	$30,352,000	$22,547,100	$16,813,000	$18,488,500	$27,072,700	$15,431,300	$20,877,300	$18,446,200
8	Total CIP	$21,618,000	$21,864,800	$37,802,000	$31,347,100	$24,463,000	$24,088,500	$32,222,700	$19,931,300	$23,877,300	$21,946,200
9	Total Wastewater CIP	$15,568,000	$17,075,300	$33,473,500	$28,265,600	$19,792,100	$18,350,100	$29,536,100	$14,089,400	$21,027,100	$19,010,500
10	Stormwater CIP	$6,050,000	$4,789,500	$4,328,500	$3,081,500	$4,670,900	$5,738,400	$2,686,600	$5,841,900	$2,850,200	$2,935,700
11	Total CIP	$21,618,000	$21,864,800	$37,802,000	$31,347,100	$24,463,000	$24,088,500	$32,222,700	$19,931,300	$23,877,300	$21,946,200
12	NPV of CIP	$901,440,500									
	Revenue Increases										
13	Proposed Percentage Revenue Increases for Wastewate	7.0%	7.0%	6.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.0%	3.0%
14	Proposed Percentage Revenue Increases for Stormwater	0.0%	0.0%	7.0%	7.0%	7.0%	6.0%	5.0%	5.0%	5.0%	5.0%
	Affordability [1]										
15	Average Wastewater Bill per Month [2]	36.73	39.32	41.71	43.40	45.12	46.50	47.91	49.32	50.81	52.32
16	Average Stormwater Bill per Month	4.50	4.50	4.82	5.16	5.52	5.85	6.14	6.45	6.77	7.11
17	Total Combined Monthly Bill	41.23	43.82	46.53	48.56	50.64	52.35	54.05	55.77	57.58	59.43
18	Median Household Income [3]	$35,724	$35,724	$35,724	$35,724	$35,724	$36,081	$36,442	$36,806	$37,174	$37,546
19	**Average Annual Wastewater and Stormwater Bill as a Percent of MHI**	**1.38%**	**1.47%**	**1.56%**	**1.63%**	**1.70%**	**1.74%**	**1.78%**	**1.82%**	**1.86%**	**1.90%**
	Debt										
20	Sewer Debt as a Percentage of Revenue [4]	21%	23%	23%	21%	25%	28%	30%	31%	35%	34%
21	Annual Sewer Debt Service Principal & Interest Payments	6,987,300	8,013,700	8,360,300	8,027,900	9,994,300	11,632,800	12,723,000	13,764,700	15,840,700	15,932,100
22	Debt Service Coverage Ratio	2.6	2.3	2.4	2.6	2.2	1.9	1.8	1.7	1.5	1.5
23	Stormwater Debt as a Percentage of Revenue [4]	33%	33%	40%	45%	48%	50%	54%	61%	61%	67%
24	Annual Stormwater Debt Service Principal & Interest Payr	1,103,100	1,101,900	1,397,400	1,681,900	1,953,800	2,142,500	2,461,200	2,891,600	3,059,100	3,526,900
25	Debt Service Coverage Ratio	2.2	2.2	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2
26	Total Debt as a Percentage of Revenue [4]	22%	24%	24%	23%	27%	30%	32%	34%	37%	37%
27	Annual Total Debt Service Principal & Interest Payments	$8,090,400	$9,115,600	$9,757,700	$9,709,800	$11,948,100	$13,775,300	$15,184,200	$16,656,300	$18,899,800	$19,459,000
28	Debt Service Coverage Ratio	2.5	2.3	2.3	2.5	2.1	1.8	1.7	1.6	1.5	1.5

Line No.		Year 11 2026 ($)	Year 12 2027 ($)	Year 13 2028 ($)	Year 14 2029 ($)	Year 15 2030 ($)	Year 16 2031 ($)	Year 17 2032 ($)	Year 18 2033 ($)	Year 19 2034 ($)	Year 20 2035 ($)	Year 21 2036 ($)	Year 22 2037 ($)	Year 23 2038 ($)	Year 24 2039 ($)	Year 25 2040 ($)
	Capital Plan by Funding Source															
1	Total CIP	$13,185,200	$23,447,500	$26,981,100	$27,454,200	$17,279,800	$52,382,000	$136,985,300	$119,016,300	$22,864,700	$84,614,400	$115,841,200	$150,664,700	$116,135,000	$123,029,400	$155,209,900
2	Sewer Cash Funded	$3,600,000	$5,100,000	$7,700,000	$9,800,000	$12,200,000	$16,500,000	$20,000,000	$21,400,000	$15,800,000	$13,400,000	$22,100,000	$22,500,000	$23,100,000	$21,300,000	$25,700,000
3	Stormwater Cash Funded	$350,000	$450,000	$600,000	$650,000	$750,000	$900,000	$950,000	$950,000	$1,350,000	$1,500,000	$1,800,000	$1,700,000	$2,000,000	$2,250,000	$2,450,000
4	Total Cash Funded CIP	$3,950,000	$5,550,000	$8,300,000	$10,450,000	$12,950,000	$17,400,000	$20,950,000	$22,350,000	$17,150,000	$14,900,000	$23,900,000	$24,200,000	$25,100,000	$23,550,000	$28,150,000
5	Sewer Debt Funded	$6,561,400	$15,233,000	$16,073,100	$14,350,000	$1,752,100	$32,454,500	$113,454,900	$93,980,000	$3,319,300	$67,356,700	$89,767,800	$124,072,100	$88,819,600	$97,387,500	$125,037,800
6	Stormwater Debt Funded	$2,673,800	$2,664,500	$2,608,000	$2,654,200	$2,577,700	$2,527,500	$2,580,400	$2,686,300	$2,395,400	$2,357,700	$2,173,400	$2,392,600	$2,215,400	$2,091,900	$2,022,100
7	Total Debt Funded CIP	$9,235,200	$17,897,500	$18,681,100	$17,004,200	$4,329,800	$34,982,000	$116,035,300	$96,666,300	$5,714,700	$69,714,400	$91,941,200	$126,464,700	$91,035,000	$99,479,400	$127,059,900
8	Total CIP	$13,185,200	$23,447,500	$26,981,100	$27,454,200	$17,279,800	$52,382,000	$136,985,300	$119,016,300	$22,864,700	$84,614,400	$115,841,200	$150,664,700	$116,135,000	$123,029,400	$155,209,900
9	Total Wastewater CIP	$10,161,400	$20,333,000	$23,773,100	$24,150,000	$13,952,100	$48,954,500	$133,454,900	$115,380,000	$19,119,300	$80,756,700	$111,867,800	$146,572,100	$111,919,600	$118,687,500	$150,737,800
10	Stormwater CIP	$3,023,800	$3,114,500	$3,208,000	$3,304,200	$3,327,700	$3,427,500	$3,530,400	$3,636,300	$3,745,400	$3,857,700	$3,973,400	$4,092,600	$4,215,400	$4,341,900	$4,472,100
11	Total CIP	$13,185,200	$23,447,500	$26,981,100	$27,454,200	$17,279,800	$52,382,000	$136,985,300	$119,016,300	$22,864,700	$84,614,400	$115,841,200	$150,664,700	$116,135,000	$123,029,400	$155,209,900
12	NPV of CIP															
	Revenue Increases															
13	Proposed Percentage Revenue Increases for Wastewate	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	9.0%	9.0%	9.0%	9.0%	9.0%
14	Proposed Percentage Revenue Increases for Stormwater	7.0%	7.0%	7.0%	5.0%	5.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.0%	2.0%	2.0%	2.0%
	Affordability [1]															
15	Average Wastewater Bill per Month [2]	56.01	59.93	64.13	68.63	73.44	78.56	84.07	89.98	96.29	103.01	112.31	122.42	133.44	145.46	158.57
16	Average Stormwater Bill per Month	7.61	8.14	8.71	9.15	9.61	9.90	10.20	10.51	10.83	11.15	11.48	11.48	11.48	11.48	11.48
17	Total Combined Monthly Bill	63.62	68.07	72.84	77.78	83.05	88.46	94.27	100.49	107.12	114.16	123.79	133.90	144.92	156.94	170.05
18	Median Household Income [3]	$37,921	$38,300	$38,683	$39,070	$39,461	$39,856	$40,255	$40,658	$41,065	$41,476	$41,891	$42,310	$42,733	$43,160	$43,592
19	**Average Annual Wastewater and Stormwater Bill as a Percent of MHI**	**2.01%**	**2.13%**	**2.26%**	**2.39%**	**2.53%**	**2.66%**	**2.81%**	**2.97%**	**3.13%**	**3.30%**	**3.55%**	**3.80%**	**4.07%**	**4.36%**	**4.68%**
	Debt															
20	Sewer Debt as a Percentage of Revenue [4]	35%	35%	34%	33%	33%	30%	28%	29%	38%	43%	38%	40%	43%	47%	47%
21	Annual Sewer Debt Service Principal & Interest Payments	17,516,600	18,849,200	19,317,200	20,254,500	21,436,400	20,864,300	20,913,100	23,228,500	32,828,600	39,951,500	38,314,400	44,065,800	51,247,200	61,357,000	66,787,000
22	Debt Service Coverage Ratio	1.5	1.5	1.7	1.7	1.8	2.0	2.2	2.2	1.7	1.5	1.7	1.7	1.6	1.5	1.5
23	Stormwater Debt as a Percentage of Revenue [4]	66%	66%	65%	65%	64%	63%	63%	63%	59%	58%	55%	56%	54%	52%	50%
24	Annual Stormwater Debt Service Principal & Interest Payr	3,738,000	3,971,500	4,205,300	4,431,900	4,649,400	4,748,600	4,872,000	5,040,100	4,893,000	4,941,800	4,852,000	5,053,300	4,943,400	4,866,100	4,776,500
25	Debt Service Coverage Ratio	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.5	1.4	1.5	1.6	1.6
26	Total Debt as a Percentage of Revenue [4]	38%	38%	37%	36%	36%	33%	31%	32%	40%	44%	39%	41%	43%	47%	47%
27	Annual Total Debt Service Principal & Interest Payments	$21,254,600	$22,820,700	$23,522,500	$24,686,400	$26,085,800	$25,612,900	$25,785,100	$28,268,600	$37,721,600	$44,893,300	$43,166,400	$49,119,100	$56,190,600	$66,223,100	$71,563,500
28	Debt Service Coverage Ratio	1.4	1.5	1.6	1.7	1.7	1.9	2.0	2.0	1.6	1.5	1.7	1.6	1.6	1.5	1.5

[1] Rate projections are estimates and are not represented to be affordable.
[2] Wastewater bills are based on average volume of 5.6 ccf per month.
[3] 2014 MHI of $35,724 held constant through 2020, then inflated each year by 1 percent.
[4] Total Annual Debt Service divided by Annual Revenues

Table 1
Scenario A3
Unified Government of Wyandotte County / Kansas City, KS
5.14% of Projected MHI in Year 25 (2040)
$1,791,195,900
2016 - 2040

Line No.		Year 1 2016 ($)	Year 2 2017 ($)	Year 3 2018 ($)	Year 4 2019 ($)	Year 5 2020 ($)	Year 6 2021 ($)	Year 7 2022 ($)	Year 8 2023 ($)	Year 9 2024 ($)	Year 10 2025 ($)
	Capital Plan by Funding Source										
1	Total CIP	$21,618,000	$21,864,800	$37,802,000	$31,347,100	$24,463,000	$24,088,500	$32,222,700	$19,931,300	$23,877,300	$21,946,200
2	Sewer Cash Funded	$9,268,000	$10,900,000	$6,600,000	$8,000,000	$6,800,000	$4,800,000	$4,500,000	$4,100,000	$2,500,000	$3,300,000
3	Stormwater Cash Funded	$2,200,000	$1,200,000	$850,000	$800,000	$850,000	$800,000	$650,000	$400,000	$500,000	$200,000
4	Total Cash Funded CIP	$11,468,000	$12,100,000	$7,450,000	$8,800,000	$7,650,000	$5,600,000	$5,150,000	$4,500,000	$3,000,000	$3,500,000
5	Sewer Debt Funded	$6,300,000	$6,175,300	$26,873,500	$20,265,600	$12,992,100	$13,550,100	$25,036,100	$9,989,400	$18,527,100	$15,710,500
6	Stormwater Debt Funded	$3,850,000	$3,589,500	$3,478,500	$2,281,500	$3,820,900	$4,938,400	$2,036,600	$5,441,900	$2,350,200	$2,735,700
7	Total Debt Funded CIP	$10,150,000	$9,764,800	$30,352,000	$22,547,100	$16,813,000	$18,488,500	$27,072,700	$15,431,300	$20,877,300	$18,446,200
8	Total CIP	$21,618,000	$21,864,800	$37,802,000	$31,347,100	$24,463,000	$24,088,500	$32,222,700	$19,931,300	$23,877,300	$21,946,200
9	Total Wastewater CIP	$15,568,000	$17,075,300	$33,473,500	$28,265,600	$19,792,100	$18,350,100	$29,536,100	$14,089,400	$21,027,100	$19,010,500
10	Stormwater CIP	$6,050,000	$4,789,500	$4,328,500	$3,081,500	$4,670,900	$5,738,400	$2,686,600	$5,841,900	$2,850,200	$2,935,700
11	Total CIP	$21,618,000	$21,864,800	$37,802,000	$31,347,100	$24,463,000	$24,088,500	$32,222,700	$19,931,300	$23,877,300	$21,946,200
12	NPV of CIP	$1,083,227,500									
	Revenue Increases										
13	Proposed Percentage Revenue Increases for Wastewater	7.0%	7.0%	6.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.0%	3.0%
14	Proposed Percentage Revenue Increases for Stormwater	0.0%	0.0%	7.0%	7.0%	7.0%	6.0%	5.0%	5.0%	5.0%	5.0%
	Affordability [1]										
15	Average Wastewater Bill per Month [2]	36.73	39.32	41.71	43.40	45.12	46.50	47.91	49.32	50.81	52.32
16	Average Stormwater Bill per Month	4.50	4.50	4.82	5.16	5.52	5.85	6.14	6.45	6.77	7.11
17	Total Combined Monthly Bill	41.23	43.82	46.53	48.56	50.64	52.35	54.05	55.77	57.58	59.43
18	Median Household Income [3]	$35,724	$35,724	$35,724	$35,724	$35,724	$36,081	$36,442	$36,806	$37,174	$37,546
19	**Average Annual Wastewater and Stormwater Bill as a Percent of MHI**	**1.38%**	**1.47%**	**1.56%**	**1.63%**	**1.70%**	**1.74%**	**1.78%**	**1.82%**	**1.86%**	**1.90%**
	Debt										
20	Sewer Debt as a Percentage of Revenue [4]	21%	23%	23%	21%	25%	28%	30%	31%	35%	34%
21	Annual Sewer Debt Service Principal & Interest Payments	6,987,300	8,013,700	8,360,300	8,027,900	9,994,300	11,632,800	12,723,000	13,764,700	15,840,700	15,932,100
22	Debt Service Coverage Ratio	2.6	2.3	2.4	2.6	2.2	1.9	1.8	1.7	1.5	1.5
23	Stormwater Debt as a Percentage of Revenue [4]	33%	33%	40%	45%	48%	50%	54%	61%	61%	67%
24	Annual Stormwater Debt Service Principal & Interest Payr	1,103,100	1,101,900	1,397,400	1,681,900	1,953,800	2,142,500	2,461,200	2,891,600	3,059,100	3,526,900
25	Debt Service Coverage Ratio	2.2	2.2	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2
26	Total Debt as a Percentage of Revenue [4]	22%	24%	24%	23%	27%	30%	32%	34%	37%	37%
27	Annual Total Debt Service Principal & Interest Payments	$8,090,400	$9,115,600	$9,757,700	$9,709,800	$11,948,100	$13,775,300	$15,184,200	$16,656,300	$18,899,800	$19,459,000
28	Debt Service Coverage Ratio	2.5	2.3	2.3	2.5	2.1	1.8	1.7	1.6	1.5	1.5

Line No.		Year 11 2026 ($)	Year 12 2027 ($)	Year 13 2028 ($)	Year 14 2029 ($)	Year 15 2030 ($)	Year 16 2031 ($)	Year 17 2032 ($)	Year 18 2033 ($)	Year 19 2034 ($)	Year 20 2035 ($)	Year 21 2036 ($)	Year 22 2037 ($)	Year 23 2038 ($)	Year 24 2039 ($)	Year 25 2040 ($)
	Capital Plan by Funding Source															
1	Total CIP	$13,185,200	$23,447,500	$26,981,100	$27,454,200	$17,279,800	$52,382,000	$136,985,300	$119,775,100	$24,427,900	$118,101,400	$151,162,100	$216,591,300	$184,039,400	$192,971,000	$227,251,700
2	Sewer Cash Funded	$4,000,000	$5,600,000	$8,200,000	$10,500,000	$12,900,000	$18,500,000	$23,600,000	$27,000,000	$23,400,000	$23,500,000	$33,700,000	$32,500,000	$31,800,000	$25,600,000	$25,700,000
3	Stormwater Cash Funded	$350,000	$450,000	$600,000	$650,000	$750,000	$900,000	$950,000	$950,000	$1,350,000	$1,500,000	$1,800,000	$1,700,000	$2,000,000	$2,250,000	$2,450,000
4	Total Cash Funded CIP	$4,350,000	$6,050,000	$8,800,000	$11,150,000	$13,650,000	$19,400,000	$24,550,000	$27,950,000	$24,750,000	$25,000,000	$35,500,000	$34,200,000	$33,800,000	$27,850,000	$28,150,000
5	Sewer Debt Funded	$6,161,400	$14,733,000	$15,573,100	$13,650,000	$1,052,100	$30,454,500	$109,854,900	$89,138,800	-$2,717,500	$90,743,700	$113,488,700	$179,998,700	$148,024,000	$163,029,100	$197,079,600
6	Stormwater Debt Funded	$2,673,800	$2,664,500	$2,608,000	$2,654,200	$2,577,700	$2,527,500	$2,580,400	$2,686,300	$2,395,400	$2,357,700	$2,173,400	$2,392,600	$2,215,400	$2,091,900	$2,022,100
7	Total Debt Funded CIP	$8,835,200	$17,397,500	$18,181,100	$16,304,200	$3,629,800	$32,982,000	$112,435,300	$91,825,100	-$322,100	$93,101,400	$115,662,100	$182,391,300	$150,239,400	$165,121,000	$199,101,700
8	Total CIP	$13,185,200	$23,447,500	$26,981,100	$27,454,200	$17,279,800	$52,382,000	$136,985,300	$119,775,100	$24,427,900	$118,101,400	$151,162,100	$216,591,300	$184,039,400	$192,971,000	$227,251,700
9	Total Wastewater CIP	$10,161,400	$20,333,000	$23,773,100	$24,150,000	$13,952,100	$48,954,500	$133,454,900	$116,138,800	$20,682,500	$114,243,700	$147,188,700	$212,498,700	$179,824,000	$188,629,100	$222,779,600
10	Stormwater CIP	$3,023,800	$3,114,500	$3,208,000	$3,304,200	$3,327,700	$3,427,500	$3,530,400	$3,636,300	$3,745,400	$3,857,700	$3,973,400	$4,092,600	$4,215,400	$4,341,900	$4,472,100
11	Total CIP	$13,185,200	$23,447,500	$26,981,100	$27,454,200	$17,279,800	$52,382,000	$136,985,300	$119,775,100	$24,427,900	$118,101,400	$151,162,100	$216,591,300	$184,039,400	$192,971,000	$227,251,700
12	NPV of CIP															
	Revenue Increases															
13	Proposed Percentage Revenue Increases for Wastewater	8.0%	7.0%	7.0%	7.0%	7.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%	9.0%
14	Proposed Percentage Revenue Increases for Stormwater	7.0%	7.0%	7.0%	5.0%	5.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.0%	2.0%	2.0%	2.0%
	Affordability [1]															
15	Average Wastewater Bill per Month [2]	56.52	60.46	64.68	69.20	74.03	80.66	87.91	95.83	104.46	113.87	124.11	135.27	147.42	160.68	175.13
16	Average Stormwater Bill per Month	7.61	8.14	8.71	9.15	9.61	9.90	10.20	10.51	10.83	11.15	11.48	11.48	11.48	11.48	11.48
17	Total Combined Monthly Bill	64.13	68.60	73.39	78.35	83.64	90.56	98.11	106.34	115.29	125.02	135.59	146.75	158.90	172.16	186.61
18	Median Household Income [3]	$37,921	$38,300	$38,683	$39,070	$39,461	$39,856	$40,255	$40,658	$41,065	$41,476	$41,891	$42,310	$42,733	$43,160	$43,592
19	**Average Annual Wastewater and Stormwater Bill as a Percent of MHI**	**2.03%**	**2.15%**	**2.28%**	**2.41%**	**2.54%**	**2.73%**	**2.92%**	**3.14%**	**3.37%**	**3.62%**	**3.88%**	**4.16%**	**4.46%**	**4.79%**	**5.14%**
	Debt															
20	Sewer Debt as a Percentage of Revenue [4]	35%	35%	33%	33%	32%	29%	26%	27%	34%	38%	33%	36%	40%	47%	50%
21	Annual Sewer Debt Service Principal & Interest Payments	17,516,600	18,849,200	19,283,000	20,177,600	21,316,800	20,684,900	20,673,900	22,818,500	32,111,200	38,820,700	36,668,200	44,416,500	53,623,400	68,508,600	78,993,900
22	Debt Service Coverage Ratio	1.5	1.6	1.7	1.8	1.8	2.1	2.4	2.4	1.9	1.8	2.1	1.9	1.8	1.5	1.5
23	Stormwater Debt as a Percentage of Revenue [4]	66%	66%	65%	65%	64%	63%	63%	63%	59%	58%	55%	56%	54%	52%	50%
24	Annual Stormwater Debt Service Principal & Interest Payr	3,738,000	3,971,500	4,205,300	4,431,900	4,649,400	4,748,600	4,872,000	5,040,100	4,893,000	4,941,800	4,852,000	5,053,300	4,943,400	4,866,100	4,776,500
25	Debt Service Coverage Ratio	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.5	1.4	1.5	1.6	1.6
26	Total Debt as a Percentage of Revenue [4]	38%	38%	37%	36%	35%	32%	30%	30%	36%	39%	34%	38%	41%	47%	50%
27	Annual Total Debt Service Principal & Interest Payments	$21,254,600	$22,820,700	$23,488,300	$24,609,500	$25,966,200	$25,433,500	$25,545,900	$27,858,600	$37,004,200	$43,762,500	$41,520,200	$49,469,800	$58,566,800	$73,374,700	$83,770,400
28	Debt Service Coverage Ratio	1.5	1.5	1.6	1.7	1.7	2.0	2.2	2.2	1.9	1.7	2.0	1.9	1.7	1.5	1.5

[1] Rate projections are estimates and are not represented to be affordable.
[2] Wastewater bills are based on average volume of 5.6 ccf per month.
[3] 2014 MHI of $35,724 held constant through 2020, then inflated each year by 1 percent.
[4] Total Annual Debt Service divided by Annual Revenues

Table 1
Scenario A4
Unified Government of Wyandotte County / Kansas City, KS
7.13% of Projected MHI in Year 25 (2040)
$2,842,117,800
2016 - 2040

Line No.		Year 1 2016 ($)	Year 2 2017 ($)	Year 3 2018 ($)	Year 4 2019 ($)	Year 5 2020 ($)	Year 6 2021 ($)	Year 7 2022 ($)	Year 8 2023 ($)	Year 9 2024 ($)	Year 10 2025 ($)
	Capital Plan by Funding Source										
1	Total CIP	$21,618,000	$21,864,800	$37,802,000	$31,347,100	$24,463,000	$24,088,500	$32,222,700	$19,931,300	$23,877,300	$21,946,200
2	Sewer Cash Funded	$9,268,000	$10,900,000	$6,600,000	$8,000,000	$6,800,000	$4,800,000	$4,500,000	$4,100,000	$2,500,000	$3,300,000
3	Stormwater Cash Funded	$2,200,000	$1,200,000	$850,000	$800,000	$850,000	$800,000	$650,000	$400,000	$500,000	$200,000
4	Total Cash Funded CIP	$11,468,000	$12,100,000	$7,450,000	$8,800,000	$7,650,000	$5,600,000	$5,150,000	$4,500,000	$3,000,000	$3,500,000
5	Sewer Debt Funded	$6,300,000	$6,175,300	$26,873,500	$20,265,600	$12,992,100	$13,550,100	$25,036,100	$9,989,400	$18,527,100	$15,710,500
6	Stormwater Debt Funded	$3,850,000	$3,589,500	$3,478,500	$2,281,500	$3,820,900	$4,938,400	$2,036,600	$5,441,900	$2,350,200	$2,735,700
7	Total Debt Funded CIP	$10,150,000	$9,764,800	$30,352,000	$22,547,100	$16,813,000	$18,488,500	$27,072,700	$15,431,300	$20,877,300	$18,446,200
8	Total CIP	$21,618,000	$21,864,800	$37,802,000	$31,347,100	$24,463,000	$24,088,500	$32,222,700	$19,931,300	$23,877,300	$21,946,200
9	Total Wastewater CIP	$15,568,000	$17,075,300	$33,473,500	$28,265,600	$19,792,100	$18,350,100	$29,536,100	$14,089,400	$21,027,100	$19,010,500
10	Stormwater CIP	$6,050,000	$4,789,500	$4,328,500	$3,081,500	$4,670,900	$5,738,400	$2,686,600	$5,841,900	$2,850,200	$2,935,700
11	Total CIP	$21,618,000	$21,864,800	$37,802,000	$31,347,100	$24,463,000	$24,088,500	$32,222,700	$19,931,300	$23,877,300	$21,946,200
12	NPV of CIP	$1,632,710,600									
	Revenue Increases										
13	Proposed Percentage Revenue Increases for Wastewater	7.0%	7.0%	6.0%	4.0%	4.0%	3.0%	3.0%	3.0%	3.0%	3.0%
14	Proposed Percentage Revenue Increases for Stormwater	0.0%	0.0%	7.0%	7.0%	7.0%	6.0%	5.0%	5.0%	5.0%	5.0%
	Affordability [1]										
15	Average Wastewater Bill per Month [2]	36.73	39.32	41.71	43.40	45.12	46.50	47.91	49.32	50.81	52.32
16	Average Stormwater Bill per Month	4.50	4.50	4.82	5.16	5.52	5.85	6.14	6.45	6.77	7.11
17	Total Combined Monthly Bill	41.23	43.82	46.53	48.56	50.64	52.35	54.05	55.77	57.58	59.43
18	Median Household Income [3]	$35,724	$35,724	$35,724	$35,724	$35,724	$36,081	$36,442	$36,806	$37,174	$37,546
19	**Average Annual Wastewater and Stormwater Bill as a Percent of MHI**	**1.38%**	**1.47%**	**1.56%**	**1.63%**	**1.70%**	**1.74%**	**1.78%**	**1.82%**	**1.86%**	**1.90%**
	Debt										
20	Sewer Debt as a Percentage of Revenue [4]	21%	23%	23%	21%	25%	28%	30%	31%	35%	34%
21	Annual Sewer Debt Service Principal & Interest Payments	6,987,300	8,013,700	8,360,300	8,027,900	9,994,300	11,632,800	12,723,000	13,764,700	15,840,700	15,932,100
22	Debt Service Coverage Ratio	2.6	2.3	2.4	2.6	2.2	1.9	1.8	1.7	1.5	1.5
23	Stormwater Debt as a Percentage of Revenue [4]	33%	33%	40%	45%	48%	50%	54%	61%	61%	67%
24	Annual Stormwater Debt Service Principal & Interest Payr	1,103,100	1,101,900	1,397,400	1,681,900	1,953,800	2,142,500	2,461,200	2,891,600	3,059,100	3,526,900
25	Debt Service Coverage Ratio	2.2	2.2	1.8	1.7	1.6	1.5	1.4	1.3	1.3	1.2
26	Total Debt as a Percentage of Revenue [4]	22%	24%	24%	23%	27%	30%	32%	34%	37%	37%
27	Annual Total Debt Service Principal & Interest Payments	$8,090,400	$9,115,600	$9,757,700	$9,709,800	$11,948,100	$13,775,300	$15,184,200	$16,656,300	$18,899,800	$19,459,000
28	Debt Service Coverage Ratio	2.5	2.3	2.3	2.5	2.1	1.8	1.7	1.6	1.5	1.5

Line No.		Year 11 2026 ($)	Year 12 2027 ($)	Year 13 2028 ($)	Year 14 2029 ($)	Year 15 2030 ($)	Year 16 2031 ($)	Year 17 2032 ($)	Year 18 2033 ($)	Year 19 2034 ($)	Year 20 2035 ($)	Year 21 2036 ($)	Year 22 2037 ($)	Year 23 2038 ($)	Year 24 2039 ($)	Year 25 2040 ($)
	Capital Plan by Funding Source															
1	Total CIP	$13,185,200	$20,756,600	$26,981,100	$27,454,200	$17,279,800	$52,382,000	$136,985,300	$120,820,700	$26,581,800	$217,011,800	$254,182,300	$419,402,100	$392,934,500	$408,133,000	$448,866,500
2	Sewer Cash Funded	$4,000,000	$5,600,000	$8,200,000	$12,300,000	$13,952,100	$29,900,000	$34,300,000	$41,700,000	$22,836,400	$69,100,000	$63,700,000	$63,100,000	$62,400,000	$48,400,000	$42,300,000
3	Stormwater Cash Funded	$350,000	$450,000	$600,000	$650,000	$750,000	$900,000	$950,000	$950,000	$1,350,000	$1,500,000	$1,800,000	$1,700,000	$2,000,000	$2,250,000	$2,450,000
4	Total Cash Funded CIP	$4,350,000	$6,050,000	$8,800,000	$12,950,000	$14,702,100	$30,800,000	$35,250,000	$42,650,000	$24,186,400	$70,600,000	$65,500,000	$64,800,000	$64,400,000	$50,650,000	$44,750,000
5	Sewer Debt Funded	$6,161,400	$12,042,100	$15,573,100	$11,850,000	$0	$19,054,500	$99,154,900	$75,484,400	$0	$144,054,100	$186,508,900	$352,209,500	$326,319,100	$355,391,100	$402,094,400
6	Stormwater Debt Funded	$2,673,800	$2,664,500	$2,608,000	$2,654,200	$2,577,700	$2,527,500	$2,580,400	$2,686,300	$2,395,400	$2,357,700	$2,173,400	$2,392,600	$2,215,400	$2,091,900	$2,022,100
7	Total Debt Funded CIP	$8,835,200	$14,706,600	$18,181,100	$14,504,200	$2,577,700	$21,582,000	$101,735,300	$78,170,700	$2,395,400	$146,411,800	$188,682,300	$354,602,100	$328,534,500	$357,483,000	$404,116,500
8	Total CIP	$13,185,200	$20,756,600	$26,981,100	$27,454,200	$17,279,800	$52,382,000	$136,985,300	$120,820,700	$26,581,800	$217,011,800	$254,182,300	$419,402,100	$392,934,500	$408,133,000	$448,866,500
9	Total Wastewater CIP	$10,161,400	$17,642,100	$23,773,100	$24,150,000	$13,952,100	$48,954,500	$133,454,900	$117,184,400	$22,836,400	$213,154,100	$250,208,900	$415,309,500	$388,719,100	$403,791,100	$444,394,400
10	Stormwater CIP	$3,023,800	$3,114,500	$3,208,000	$3,304,200	$3,327,700	$3,427,500	$3,530,400	$3,636,300	$3,745,400	$3,857,700	$3,973,400	$4,092,600	$4,215,400	$4,341,900	$4,472,100
11	Total CIP	$13,185,200	$20,756,600	$26,981,100	$27,454,200	$17,279,800	$52,382,000	$136,985,300	$120,820,700	$26,581,800	$217,011,800	$254,182,300	$419,402,100	$392,934,500	$408,133,000	$448,866,500
12	NPV of CIP															
	Revenue Increases															
13	Proposed Percentage Revenue Increases for Wastewater	8.0%	7.0%	7.0%	10.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%	12.0%
14	Proposed Percentage Revenue Increases for Stormwater	7.0%	7.0%	7.0%	5.0%	5.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	2.0%	2.0%	2.0%	2.0%
	Affordability [1]															
15	Average Wastewater Bill per Month [2]	56.52	60.46	64.68	71.18	79.71	89.25	99.97	111.99	125.43	140.47	157.31	176.17	197.32	220.98	247.48
16	Average Stormwater Bill per Month	7.61	8.14	8.71	9.15	9.61	9.90	10.20	10.51	10.83	11.15	11.48	11.48	11.48	11.48	11.48
17	Total Combined Monthly Bill	64.13	68.60	73.39	80.33	89.32	99.15	110.17	122.50	136.26	151.62	168.79	187.65	208.80	232.46	258.96
18	Median Household Income [3]	$37,921	$38,300	$38,683	$39,070	$39,461	$39,856	$40,255	$40,658	$41,065	$41,476	$41,891	$42,310	$42,733	$43,160	$43,592
19	**Average Annual Wastewater and Stormwater Bill as a Percent of MHI**	**2.03%**	**2.15%**	**2.28%**	**2.47%**	**2.72%**	**2.99%**	**3.28%**	**3.62%**	**3.98%**	**4.39%**	**4.84%**	**5.32%**	**5.86%**	**6.46%**	**7.13%**
	Debt															
20	Sewer Debt as a Percentage of Revenue [4]	35%	35%	33%	31%	30%	26%	23%	21%	27%	28%	24%	29%	34%	46%	52%
21	Annual Sewer Debt Service Principal & Interest Payments	17,516,600	18,849,200	19,283,000	19,947,800	21,087,000	20,301,400	20,200,600	21,371,800	29,750,800	35,294,400	33,373,900	45,674,300	61,116,100	90,705,800	116,415,200
22	Debt Service Coverage Ratio	1.5	1.6	1.7	1.9	2.1	2.5	3.0	3.2	2.7	2.6	3.1	2.6	2.2	1.7	1.5
23	Stormwater Debt as a Percentage of Revenue [4]	66%	66%	65%	65%	64%	63%	63%	63%	59%	58%	55%	56%	54%	52%	50%
24	Annual Stormwater Debt Service Principal & Interest Payr	3,738,000	3,971,500	4,205,300	4,431,900	4,649,400	4,748,600	4,872,000	5,040,100	4,893,000	4,941,800	4,852,000	5,053,300	4,943,400	4,866,100	4,776,500
25	Debt Service Coverage Ratio	1.2	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.4	1.4	1.5	1.4	1.5	1.6	1.6
26	Total Debt as a Percentage of Revenue [4]	38%	38%	37%	35%	33%	29%	26%	24%	29%	30%	26%	30%	35%	46%	52%
27	Annual Total Debt Service Principal & Interest Payments	$21,254,600	$22,820,700	$23,488,300	$24,379,700	$25,736,400	$25,050,000	$25,072,600	$26,411,900	$34,643,800	$40,236,200	$38,225,900	$50,727,600	$66,059,500	$95,571,900	$121,191,700
28	Debt Service Coverage Ratio	1.5	1.5	1.6	1.8	1.9	2.3	2.6	2.9	2.5	2.5	2.9	2.5	2.2	1.7	1.5

[1] Rate projections are estimates and are not represented to be affordable.
[2] Wastewater bills are based on average volume of 5.6 ccf per month.
[3] 2014 MHI of $35,724 held constant through 2020, then inflated each year by 1 percent.
[4] Total Annual Debt Service divided by Annual Revenues

Appendix E –

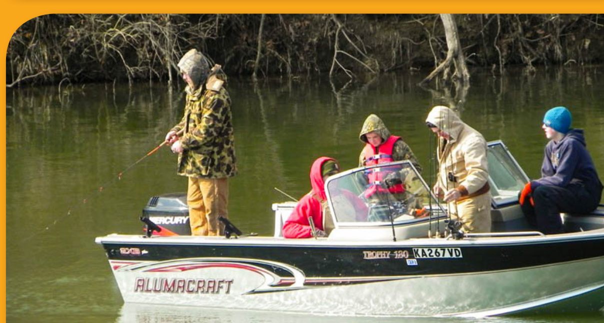
IOCP Public Outreach Brochures

System Overview

Ever wonder what happens after you flush?

The Unified Government of Wyandotte County / Kansas City, Kansas has a complex system of pipes and treatment facilities that transport and treat wastewater generated by over 110,000 customers. Wastewater is the used water and sewage that goes down toilets, sinks, and drains in homes and businesses.

As in most communities, wastewater is collected by an extensive system of pipes, and transported to a treatment plant where it is treated and discharged to a river or stream.



How can you participate?

The Unified Government will be making presentations at community meetings over the next two years. If you would like to schedule a presentation, please call (913) 573-5700. You can also visit **www.wycokck.org/pw** or email **IOCP@wycokck.org** to find out more about this issue and provide comments.

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INTEGRATED OVERFLOW CONTROL PLAN

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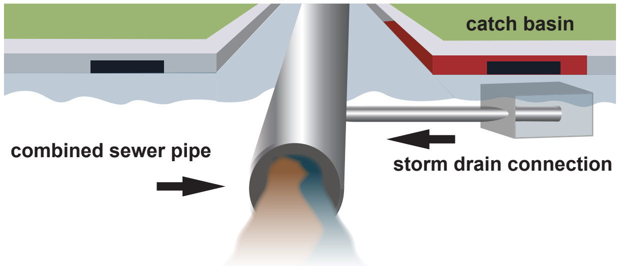
What's the Problem?

The Unified Government must continue to invest in its wastewater system. State and federal regulators are tightening enforcement of the federal Clean Water Act as Unified Government's wastewater infrastructure continues to age. The Unified Government has continuously invested in system upgrades, but much work remains to be done. Hundreds of millions of dollars will be needed to replace and renew aging infrastructure and improve the system. The Unified Government is taking proactive steps to prepare a plan that meets the regulations, but more importantly, meets the needs of the Wyandotte County community. Your input into this plan is valuable.

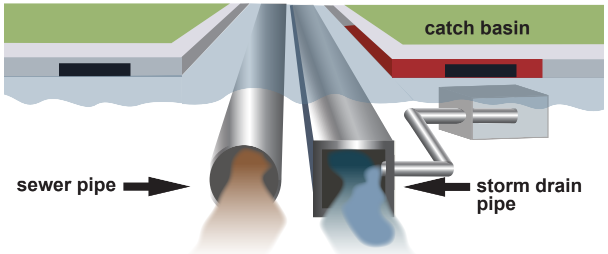
A **combined sewer system** and a separate sewer system serve the Unified Government's customers. A combined sewer system is simply a single sewer system that carries both wastewater and stormwater in one pipe to a nearby treatment plant.

During periods of moderate or heavy rainfall, the sewer system can reach capacity, overflow, and discharge a mixture of wastewater and stormwater into our environment.



Combined wastewater and stormwater may flow untreated to local waterbody during heavy rain storms.

A **separate sewer system** consists of two separate pipes, one for stormwater runoff that is discharged directly into a nearby waterway and the other for wastewater, which is transported to a nearby treatment plant.



to the wastewater treatment plant **to the local waterbody**

The Clean Water Act of 1972 provides regulations for both types of sewer systems. Combined sewer overflows are permitted with limitations on the quantity and frequency of sewage discharge. The law does not permit the separate sewer system to overflow. Currently, the Unified Government is preparing the right plan to reduce combined sewer overflows, and eliminate sanitary sewer overflows at a reasonable cost to ratepayers.

The Plan

The Unified Government has always been in the business of protecting public health and the environment. The Unified Government is taking proactive steps to prepare a plan that meets the regulations, but more importantly, meets the needs of the Wyandotte County community. The plan is part of a national effort to protect our streams, rivers, and lakes. It is a roadmap for reducing sewer overflows and improving waterways.

Planning is underway. Customer input will be important as environmental priorities are established, and projects identified. Ratepayers will make a substantial investment in aging infrastructure to reduce overflows. The benefits of that investment are:

- Sewer system reliability;
- Community infrastructure enhancements;
- Local job creation;
- System capacity for redevelopment and growth; and
- Cleaner waterways.

An Integrated Overflow Control Plan (IOCP) is being developed as part of a negotiated agreement with the United States Environmental Protection Agency. The plan will be submitted on or before September 30, 2016, and will provide a list of projects and a schedule for addressing sewer overflows. The plan will define the increased reinvestment in an important community asset – our sewers.

Integrated Overflow Control Plan Goals

- Protect human health, public safety, and property.
- Meet regulations.
- Protect water quality.

INTEGRATED OVERFLOW CONTROL PLAN

Unified Government of Wyandotte County / Kansas City, Kansas

System Overview

Ever wonder what happens after you flush?

The Unified Government of Wyandotte County / Kansas City, Kansas has a complex system of pipes and treatment facilities that transport and treat wastewater generated by over 110,000 customers. Wastewater is the used water and sewage that goes down toilets, sinks, and drains in homes and businesses. As in most communities, wastewater is collected by an extensive system of pipes, and transported to a treatment plant where it is treated and discharged to a river or stream.

What's the Problem?

The Unified Government must continue to invest in its wastewater system. State and federal regulators are tightening enforcement of the federal Clean Water Act as Unified Government's wastewater infrastructure continues to age. The Unified Government has continuously invested in system upgrades, but much work remains to be done. Hundreds of millions of dollars will be needed to replace and renew aging infrastructure and improve the system. The Unified Government is taking proactive steps to prepare a plan that meets the regulations, but more importantly, meets the needs of the Wyandotte County community. Your input into this plan is valuable.

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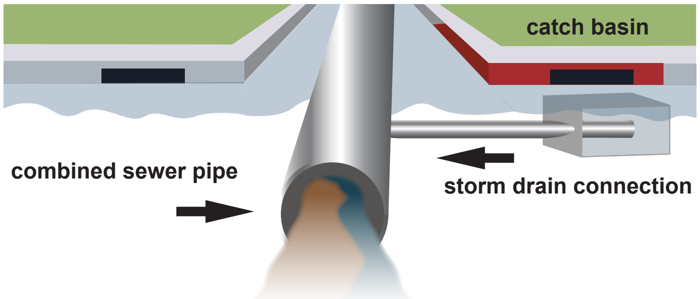
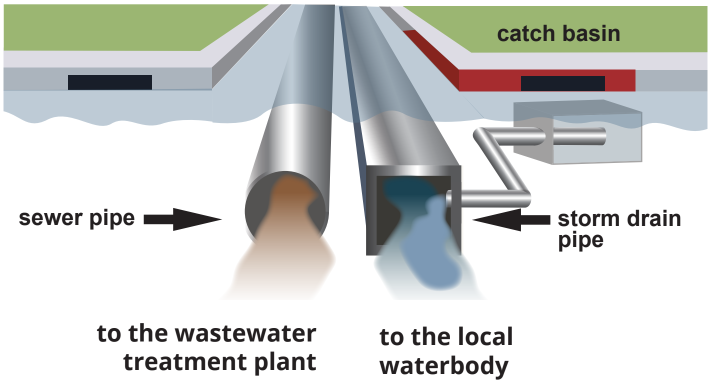


Combined wastewater and stormwater may flow untreated to local waterbody during heavy rain storms.

During periods of moderate or heavy rainfall, the sewer system can reach capacity, overflow, and discharge a mixture of wastewater and stormwater into our environment.



A **separate sewer system** consists of two separate pipes, one for stormwater runoff that is discharged directly into a nearby waterway and the other for wastewater, which is transported to a nearby treatment plant.
The Clean Water Act of 1972 provides regulations for both types of sewer systems. Combined sewer overflows are permitted with limitations on the quantity and frequency of sewage discharge. The law does not permit the separate sewer system to overflow. Currently, the Unified Government is preparing the right plan to reduce combined sewer overflows, and eliminate sanitary sewer overflows at a reasonable cost to ratepayers.

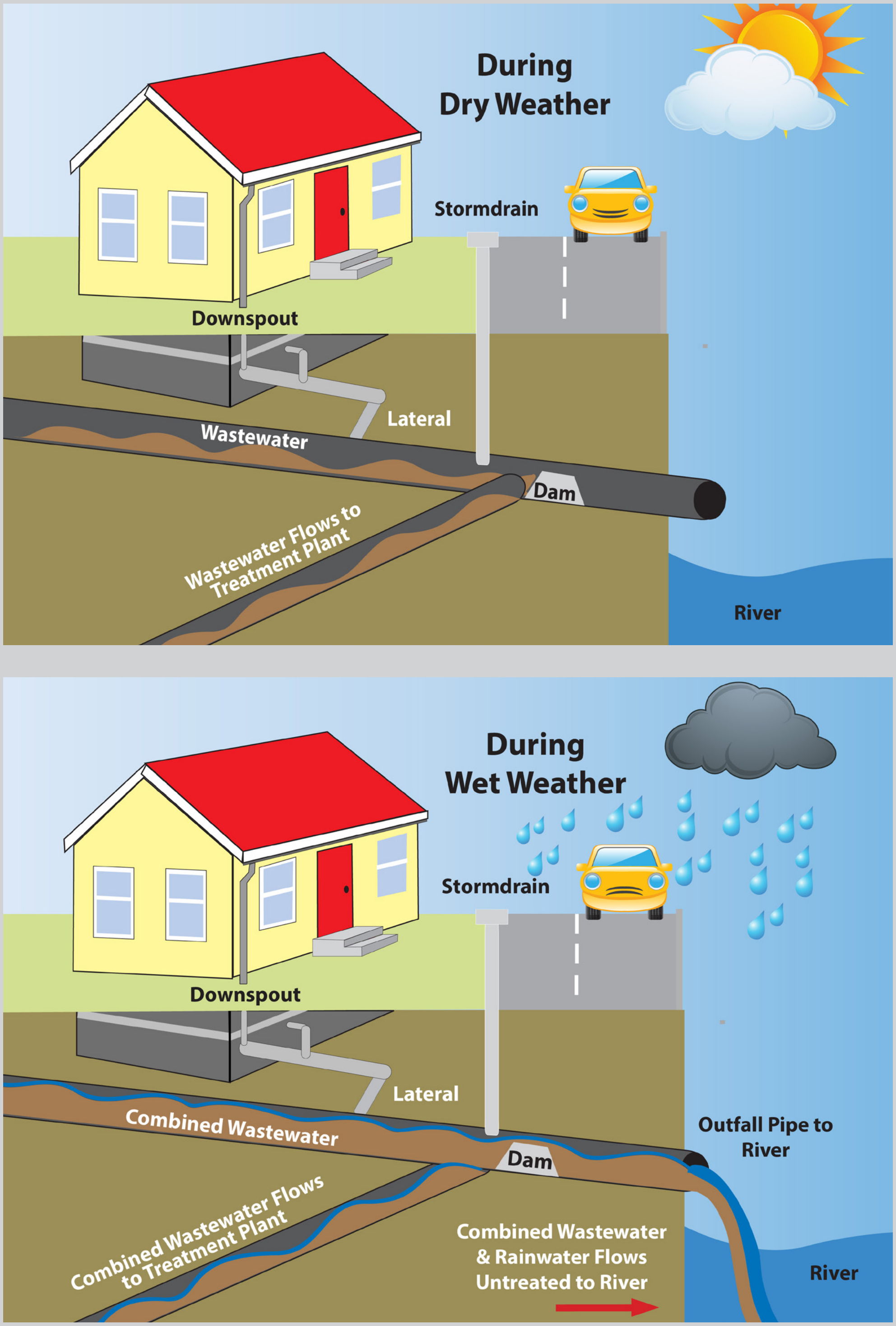
What are sewer overflows?

Our community experiences two different types of overflows: combined sewer overflows (CSOs) and sanitary sewer overflows (SSOs).

Combined Sewer Overflows (CSOs)

Most of the time, combined sewer systems transport all of the wastewater to a wastewater treatment plant, where it is cleaned and then sent to a nearby waterbody. During periods of moderate to heavy rainfall, the volume of wastewater mixed with stormwater can exceed the capacity of the sewer system or treatment plant. Combined sewer systems are actually designed to overflow occasionally and send excess wastewater directly to nearby streams, rivers, and lakes. This was a common practice in the United States prior to the 1940s. There are 772 cities in the United States with combined sewer systems working to reduce the quantity and frequency of diluted untreated sewage overflowing during rain storms.

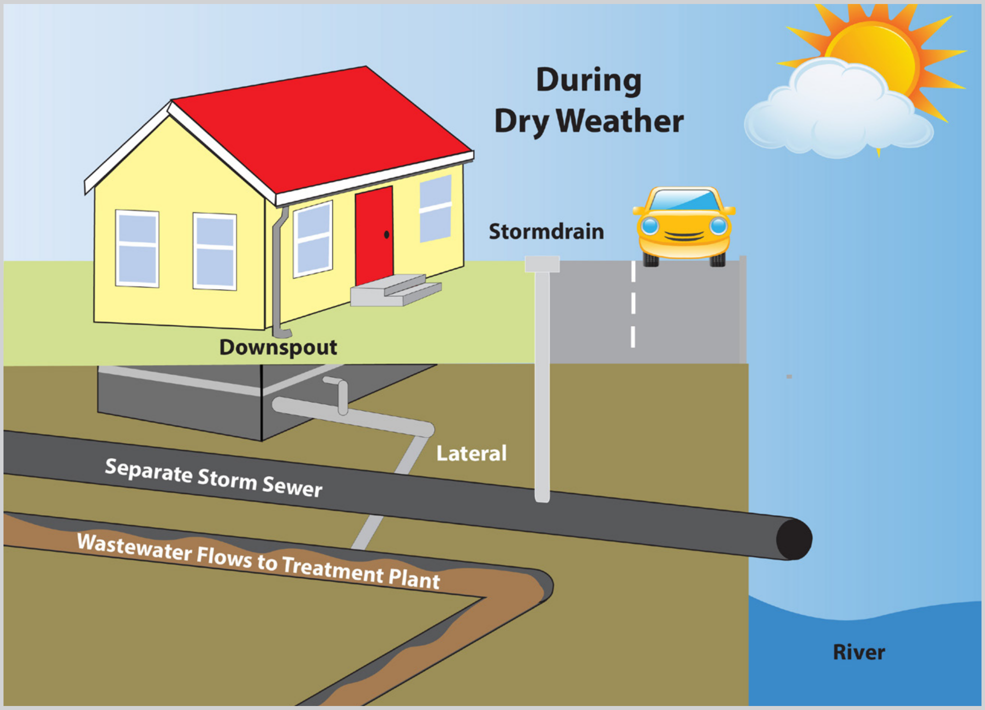
COMBINED SEWER SYSTEMS

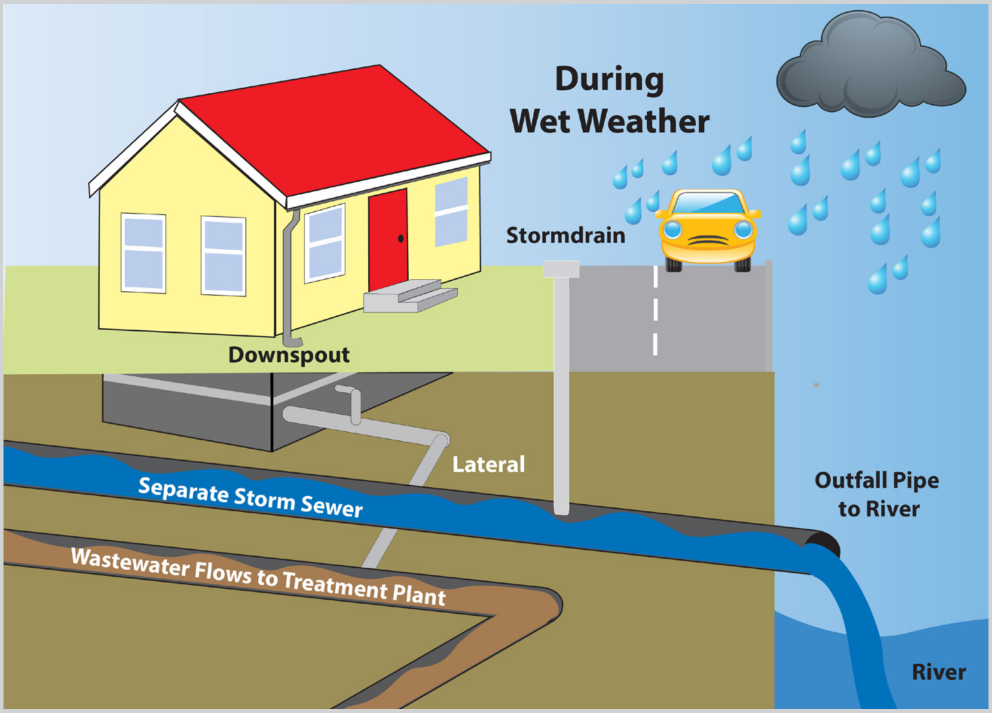


Sanitary Sewer Overflows (SSOs)

A separate sewer system has one pipe that carries wastewater and another pipe carries stormwater. The pipe systems are separate. Properly designed, operated, and maintained sanitary sewer systems are meant to collect and transport all of the sewage that flows into them to a wastewater treatment plant. However, occasional unintentional discharges of raw sewage from municipal sanitary sewers occur in almost every community. These types of discharges are called sanitary sewer overflows (SSOs). SSOs have a variety of causes, including but not limited to, blockages, line breaks, sewer defects, power failures, inadequate sewer design, and vandalism. The untreated sewage from these overflows contaminate our environment. It can also back-up into basements, causing property damage.

SEPARATE SEWER SYSTEMS





The Plan

The Unified Government has always been in the business of protecting public health and the environment. The Unified Government is taking proactive steps to prepare a plan that meets the regulations, but more importantly, meets the needs of the Wyandotte County community. The plan is part of a national effort to protect our streams, rivers, and lakes. It is a roadmap for reducing sewer overflows and improving waterways.

Planning is underway. Customer input will be important as environmental priorities are established, and projects identified. Ratepayers will make a substantial investment in aging infrastructure to reduce overflows. The benefits of that investment are:

- Sewer system reliability;
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- Local job creation;
- System capacity for redevelopment and growth; and
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An Integrated Overflow Control Plan (IOCP) is being developed as part of a negotiated agreement with the United States Environmental Protection Agency. The plan will be submitted on or before September 30, 2016, and will provide a list of projects and a schedule for addressing sewer overflows. The plan will define the increased reinvestment in an important community asset – our sewers.

Integrated Overflow Control Plan Goals

- **Protect human health, public safety, and property.**
- **Meet regulations.**
- **Protect water quality.**

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

How can you participate?

The Unified Government will be making presentations at community meetings over the next two years. If you would like to schedule a presentation, please call (913) 573-5700. You can also visit **www.wycokck.org/pw** or email **IOCP@wycokck.org** to find out more about this issue and provide comments.

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System Overview

The Unified Government has a complex system of pipes and treatment facilities that transport and treat wastewater generated by over 150,000 residents. Our wastewater system includes

- 5 treatment plants
- 70 pump stations
- 1,200+ miles of sewer lines

Our system consists of both combined and separate sewer systems.

Integrated Overflow Control Plan Goals

- Protect human health, private property, and public safety
- Enhance service reliability
- Improve water quality

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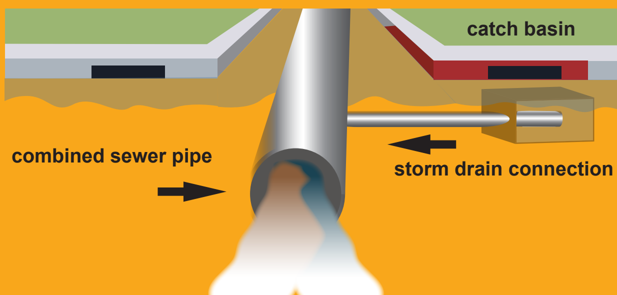
What's the Problem?

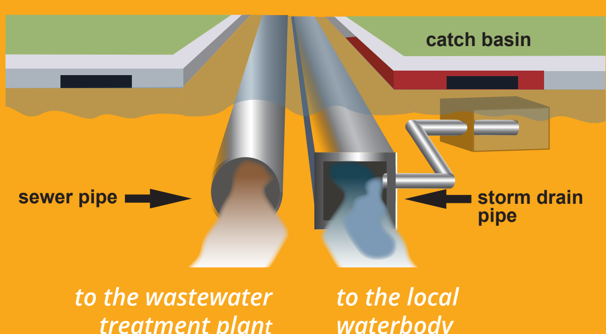
The Clean Water Act of 1972 requires reduction of combined sewer overflows and elimination of separate sewer overflows.

A **combined sewer system** is simply a single sewer system that carries both wastewater and rainwater within one pipe to a treatment plant. During heavy rainstorms, the combined sewer pipes overflow sending a mixture of wastewater and rainwater into a nearby stream or river.



Combined wastewater and stormwater may flow untreated to local waterbody during heavy rain storms

A **separate sewer system** consists of two pipes – one carries rainwater runoff to a nearby stream or river and the other transports wastewater to a treatment plant. Sometimes when it rains, this system overflows sending a mixture of rainwater and wastewater into our waterways.



Progress

Our wastewater system protects public health and the environment. Over the past 15 years, ratepayers significantly invested in upgrades to our sewer system. As a result, there are 18 fewer locations where combined sewage no longer overflows into our waterways and the total volume of overflow was reduced by 20%.

In March of 2013, the Unified Government entered an agreement with the federal government requiring more investment and further overflow reduction. The agreement required improvements to the existing system and the development of an Integrated Overflow Control Plan.

Recommended Plan

To prepare the Integrated Overflow Control Plan, we've studied the sewer system and identified problem areas. We found cracked and leaking clay pipe over 50 years old in many parts of the community in need of significant repair. We asked citizens where they would like to see dollars invested. The community indicated that the highest priority is to improve service reliability by fixing the existing system where it is most cost-effective.

The recommended 10-year, $200 million plan targets resources on renewing wastewater pipes and facilities to make more progress towards meeting the goals of the Clean Water Act. Sewer ratepayers fund the work recommended in the plan.

Specifically, the Recommended Plan includes

- Investigate and repair existing sewer infrastructure across the community
- Upgrade technology throughout facilities to better monitor the system
- Construct a new wastewater treatment plant to substantially reduce overflows and accommodate new ratepayers
- Reduce rainwater getting into combined sewers by rehabilitating sewer pipes and installing green infrastructure
- Increase maintenance of existing sewer pipes and facilities

Unified Government will submit the recommended Integrated Overflow Control Plan to regulators by September 30, 2016.

Appendix F –

IOCP Webpage

UNIFIED GOVERNMENT OF WYANDOTTE COUNTY AND KANSAS CITY, KANSAS

INTEGRATED OVERFLOW CONTROL PLAN

PREPARING A PLAN TO REINVEST IN OUR SEWER SYSTEM WHILE MEETING THE NEEDS OF OUR COMMUNITY

SCROLL DOWN

The Unified Government of Wyandotte County and Kansas City, Kansas must continue to invest in its aging sewer pipes and wastewater facilities. Our wastewater system is a complex system of pipes and treatment facilities that carry sewage from over 100,000 homes and businesses everyday.

Part of our original sewer system was built over 100 years ago, and much of this is still in use today. When it rains, rainwater can get into our sewer system through storm drains and cracks in the pipes. This can result in sewer overflows, which release a mixture of rainwater and sewage into our environment.

The Integrated Overflow Control Plan will focus on fixing our aging pipes and facilities to reduce sewer overflows and improve the reliability of our sewer system.

What Is This Plan About?

The Integrated Overflow Control Plan will outline the necessary steps to repair and improve our aging sewer system.

LEARN MORE

How Can You Participate?

Interested in hearing more? Unified Government staff members are available to make presentations to your community or neighborhood group.

SIGN UP

OUR INTEGRATED OVERFLOW CONTROL PLAN

What is the Integrated Overflow Control Plan?

Our Recommended Plan

The Unified Government has always been in the business of protecting public health and the environment. We are recommending a plan that makes continued progress towards meeting the goals of the Clean Water Act.

The Plan is part of a national effort to protect our streams, rivers, and lakes. It is a roadmap for reducing sewer overflows and improving our waterways.

Community input plays an important role as we establish our priorities and identify the work that needs to be done. The results of our Plan will bring many benefits to our community, such as:

- Sewer system reliability
- Community infrastructure enhancements
- System capacity for redevelopment and growth
- Cleaner waterways

The recommended **10-year, $200 million** plan targets resources on renewing wastewater pipes and facilities to make more progress towards meeting the goals of the Clean Water Act. Your wastewater rates will fund the work that is outlined in this Plan.

Specifically, the Recommended Plan includes:

- Investigate and repair existing sewer infrastructure across the community
- Upgrade technology throughout facilities to better monitor the system
- Construct a new wastewater treatment plant to substantially reduce overflows and accommodate new ratepayers
- Reduce rainwater getting into combined sewers by rehabilitating sewer pipes and installing green infrastructure
- Increase maintenance of existing sewer pipes and facilities

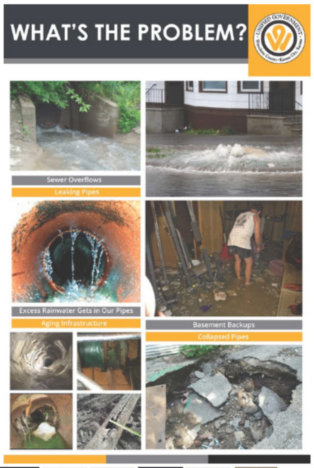
Unified Government will submit the recommended Integrated Overflow Control Plan to regulators by September 30, 2016.

INTEGRATED OVERFLOW CONTROL PLAN

HOME ABOUT THE PLAN CONTACT

OUR INTEGRATED OVERFLOW CONTROL PLAN

A Visual Summary



DOWNLOAD OUR BROCHURE TO SHARE WITH FRIENDS AND NEIGHBORS

brochure.pdf
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PARTIAL CONSENT DECREE

partial_consent_decree.pdf
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OUR RECOMMENDED PLAN

THE 10-YEAR, $200 MILLION PLAN FOCUSES ON RENEWING WASTEWATER PIPES AND FACILITIES

DOWNLOAD THE RECOMMENDED PLAN DRAFT:

iocp_report__draft_.pdf
Download File

Tell Us What You Think!

What do you think about our Recommended Plan? *

SUBMIT

Our Recommended Plan

The recommended 10-year, $200 million plan targets resources on renewing wastewater pipes and facilities to make more progress towards meeting the goals of the Clean Water Act. Your wastewater rates will fund the work that is outlined in this Plan.

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Contact Us

Interested in hearing more? Unified Government staff members are available to make presentations to your community or neighborhood group.

Name *

First Last

Email *

Comment *

SUBMIT

EMAIL ADDRESS

IOCP@wycokck.org

TELEPHONE NUMBER

913-573-1333

WEB

Unified Government Public Works Department

Unified Government Water Pollution Control Division

Enter Your Email Address to Receive Email Updates

Email *

SUBMIT

COMMUNITY SURVEY

YOUR INPUT INTO THIS PLAN IS VALUABLE AS WE WEIGH IMPORTANT FACTORS TO FIND A BALANCED AND AFFORDABLE PLAN FOR OUR COMMUNITY

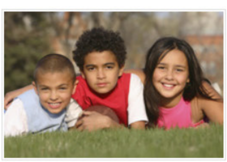
What Do You Think?

Part of our original sewer system was built over 100 years ago, and much of it is still in use today. When it rains, rainwater can get into our sewer system through storm drains and cracks in the pipes. This can result in a sewer overflow, which releases a mixture of rainwater and sewage into our environment.

The Integrated Overflow Control Plan will focus on fixing our aging pipes and facilities to reduce sewer overflows and improve the reliability of our sewer system.

Your input into this plan is valuable. We are taking proactive steps to prepare a plan that meets the regulations, but more importantly, meets the needs of our community.

1. Our community faces many other challenges in addition to our aging sewer system. We want to know how important this issue is compared to other issues in the community.
By checking the boxes below, choose THREE of the issues most important to you.



Choose Three

- ☐ Air Quality
- ☐ Public Health (teen pregnancy, obesity, smoking, etc.)
- ☐ Drinking Water Quality
- ☐ Economic Development
- ☐ Education
- ☐ Job Opportunities
- ☐ Maintain Existing Infrastructure (roads, bridges, sewers, etc.)
- ☐ Public Safety
- ☐ Transportation Options (buses, cars, bikes, etc.)
- ☐ Water Quality (streams, lakes, and rivers)

COMMUNITY SURVEY

YOUR INPUT INTO THIS PLAN IS VALUABLE AS WE WEIGH IMPORTANT FACTORS TO FIND A BALANCED AND AFFORDABLE PLAN FOR OUR COMMUNITY

2. Do you or your family members swim or wade in these water bodies?

Digital image., twolfgdcwordpress.com., Web. 9 Feb. 2016.

Check all that apply

- [ ] Big 11 Lake
- [ ] Jersey Creek
- [ ] Kansas River
- [ ] Mattoon Creek
- [ ] Missouri River
- [ ] Wyandotte County Lake
- [ ] I do not swim or wade in any of these water bodies

Other:

3. Do you or your family members boat, canoe, or fish on these water bodies?

Check all that apply

- [ ] Big 11 Lake
- [ ] Jersey Creek
- [ ] Kansas River
- [ ] Mattoon Creek
- [ ] Missouri River
- [ ] Wyandotte County Lake
- [ ] I do not boat, canoe, or fish on any of these water bodies

Other:

4. Do you or your family members hike, walk, bike, camp, or participate in social events along or on the banks of these water bodies?

Digital image., KC Levee Trail. Web. 9 Feb. 2016.

Check all that apply

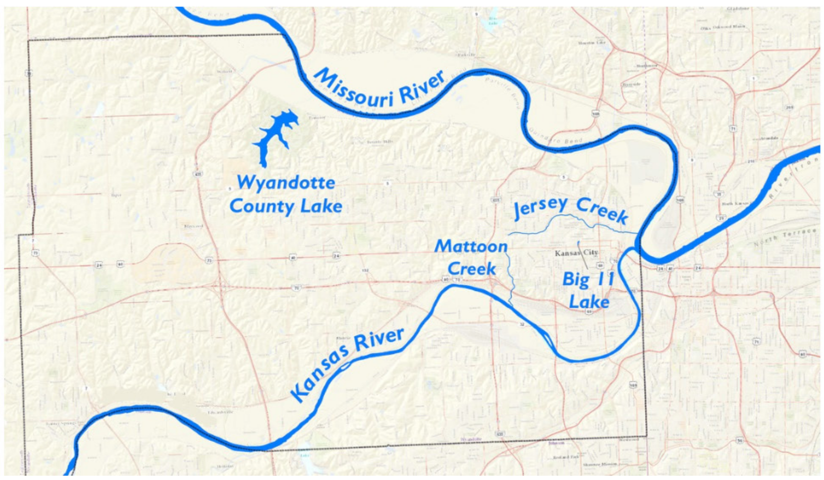
- [ ] Big 11 Lake
- [ ] Jersey Creek
- [ ] Kansas River
- [ ] Mattoon Creek
- [ ] Missouri River
- [ ] Wyandotte County Lake
- [ ] I do not participate in activities near these water bodies

Other:

COMMUNITY SURVEY

YOUR INPUT INTO THIS PLAN IS VALUABLE AS WE WEIGH IMPORTANT FACTORS TO FIND A BALANCED AND AFFORDABLE PLAN FOR OUR COMMUNITY

5. The map below shows a few of the water bodies you may know. We are curious to know which ones you think are the most important to keep clean.



Tell us which water body is the single most important to you and why? *

6. State your level of agreement with the following statement: *Investments made to improve our wastewater system should not only consider the environment, but also the financial ability of citizens to pay for the improvements.*

Choose One *

- Strongly Agree
- Agree
- Disagree
- Strongly Disagree
- I Need More Information

SUBMIT

Thank You!

INTEGRATED OVERFLOW CONTROL PLAN

HOME | ABOUT | COMMUNITY SURVEY | EN ESPAÑOL | THE PLAN | CONTACT

ENCUESTA DE LA COMUNIDAD

SU ENTRADA EN ESTE PLAN ES VALIOSA. ESTAMOS TOMANDO MEDIDAS PARA PREPARER UN PLAN QUE RESPONDE A LAS NORMAS, PERO MAS IMPORTANTE AUN, LAS NECESIDADES DE NUESTRA COMUNIDAD.

¿Qué Piensas?

Durante periodos de lluvia moderada o fuerte, los sistemas de alcantarillado pueden saciarse, desbordarse y descargar una combinación de aguas residuales y agua de lluvia a nuestro medio ambiente.

El Gobierno Unificado (Unified Government) siempre se ha preocupado en la protección de la salud publica y el medio ambiente. El Gobierno Unificado (Unified Government) esta tomando medidas de manera proactiva para preparar un plan que cumpla con las regulaciones, pero más importante, cumpla con las necesidades de la comunidad del Condado de Wyandotte. El plan es parte de esfuerzos a nivel nacional para proteger nuestras corrientes, ríos y lagos. Es el camino hacia reducir el desborde de desagüe y mejorar los viaductos acuáticos.

Su entrada en este plan es valiosa. Estamos tomando medidas para preparer un plan que responde a las normas, pero mas importante aun, las necesidades de nuestra comunidad.

1. Nuestra comunidad se enfrenta a muchos otros retos además de nuestro viejo sistema de alcantarillado. Queremos saber que tan importante es este problema comparado a otros en la comunidad.

1. Nuestra comunidad se enfrenta a muchos otros retos además de nuestro viejo sistema de alcantarillado. Queremos saber que tan importante es este problema comparado a otros en la comunidad.
Al marcar las siguientes casillas, seleccione TRES de los problemas mas importantes para usted.

Seleccione tres *

- ☐ Calidad del Aire
- ☐ Salud Publica (embarazos adolecentes, obesidad, fumar, etc.)
- ☐ Calidad del Agua Potable
- ☐ Desarrollo Económico
- ☐ Educación
- ☐ Oportunidades de Trabajo
- ☐ Mantener Infraestructuras Existentes (calles, puentes, alcantarillas)
- ☐ Seguridad Publica
- ☐ Opciones de Transporte (buses, carros, bicicletas, etc.)
- ☐ Calidad del Agua (arroyos, lagos y ríos)

3. Usted o miembros de su familia pasea en barco, canoa, o pesca en alguno de los siguientes cuerpos de agua?

Seleccione todas las que correspondan. *

- ☐ Lago Big 11 (Big 11 Lake)
- ☐ Arroyo Jersey (Jersey Creek)
- ☐ Rio Kansas (Kansas River)
- ☐ Arroyo Mattoon (Mattoon Creek)
- ☐ Rio de Missouri (Missouri River)
- ☐ Lago del Condado de Wyandotte (Wyandotte County Lake)
- ☐ No paseo en barco, canoa, o pesco en ninguno de estos cuerpos de agua.

Other: *

3. Usted o miembros de su familia pasea en barco, canoa, o pesca en alguno de los siguientes cuerpos de agua?

Digital image., KC Levee Trail. Web. 9 Feb. 2016.

Seleccione todas las que correspondan. *

- ☐ Lago Big 11 (Big 11 Lake)
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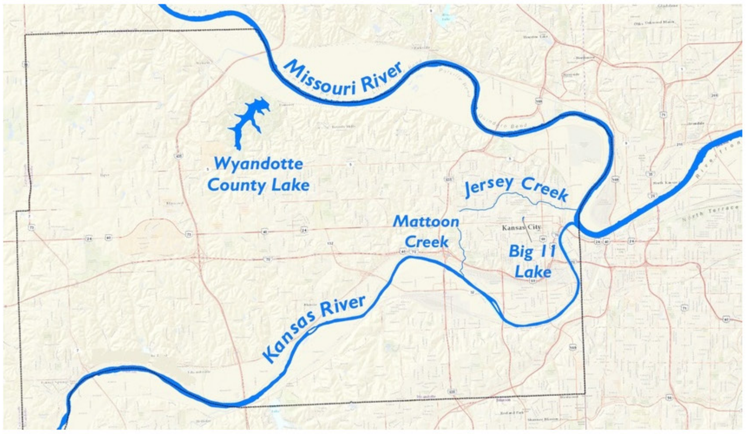
- ☐ Lago del Condado de Wyandotte (Wyandotte County Lake)
- ☐ No nado o vadeo en ninguno de estos cuerpos de agua.

Other: *

ENCUESTA DE LA COMUNIDAD

SU ENTRADA EN ESTE PLAN ES VALIOSA. ESTAMOS TOMANDO MEDIDAS PARA PREPARER UN PLAN QUE RESPONDE A LAS NORMAS, PERO MAS IMPORTANTE AUN, LAS NECESIDADES DE NUESTRA COMUNIDAD.

5. El siguiente mapa muestra algunos de los cuerpos de agua que tal ves reconozca. Tenemos curiosidad en saber cual piensa usted que es el más importante mantener limpio.



Díganos cual cuerpo de agua es el más importante para usted y, ¿por que? *

6. Indique su nivel de acuerdo con las siguiente declaración: Inversiones hechas para mejorar nuestro sistema de aguas residuales no solo debería considerar al medio ambiente, pero también la habilidad financiera de los ciudadanos para pagar por las mejoras.

Seleccione una. *

- Estoy Completamente de Acuerdo
- Estoy de Acuerdo
- Estoy en Desacuerdo
- Estoy Completamente en Desacuerdo

SUBMIT

Appendix G –

Community Task Force Presentations

Integrated Overflow Control Plan Stakeholder Group – Worksession #1

December 5, 2015 9 – 11:30 a.m.

Location: Kaw Point Wastewater Treatment Plant

Goals

- Protect human health, public safety, & property
- Meet regulations
- Protect water quality

Questions to Provide Recommendations

- What are the environmental priorities of the community?
- Should UG control the number and frequency of sewage overflows based on the environmental importance of each local waterway?
- Should the investment in our wastewater system address other desired community outcomes such as flood damage reduction and economic revitalization?

Schedule

- Saturday, December 5, 2015
  - 9:00 a.m. – Noon

Three more meetings in January & February 2016

Agenda

Welcome & Introductions	9:00 a.m.
Purpose of Workshop & Stakeholder Group Charge	9:15 a.m.
Integrated Overflow Control Plan Overview	9:30 a.m.
System Problem Discussion with Maps	10:00 a.m.
State of Water Quality	10:30 a.m.
BREAK	11:00 a.m.
Environmental/Public Health Discussion	11:25 a.m.
Next Steps & Adjourn	11:30 a.m.

Overview

- We will preserve our system and continue protecting our rivers and lakes
- Major upgrades will be coming to our sewer system
- We appreciate your time and input

The Regulatory Landscape

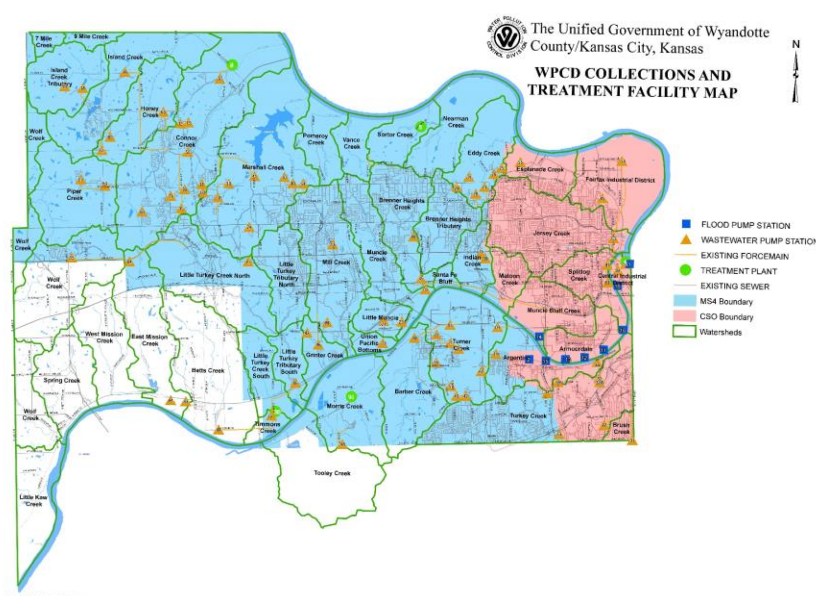
- All our work is regulated by EPA and KDHE under the Clean Water Act
- Kansas City, like most major cities, is required to dramatically reduce overflows
- We are currently preparing a plan to meet regulatory requirements now and long into the future.

*Ever wonder what happens **after** you flush?*

- If you live in the Unified Government, what should happen after you flush is a hot topic.

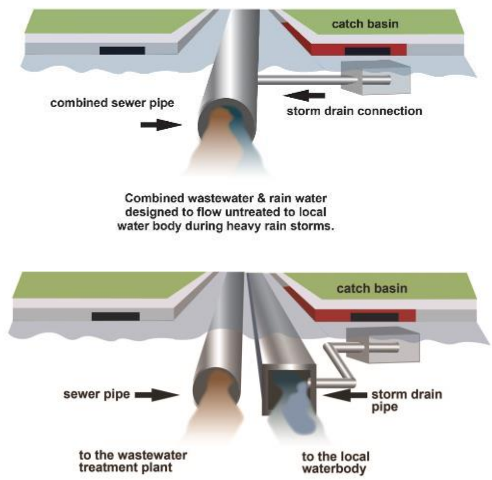
Wastewater System

- 158 square miles
- 40,000 residential accounts
- 3,500 commercial/industrial accounts
- 5 wastewater treatment plants
- 800 miles of sewers
- 115 employees
- 83 wastewater pump stations & 9 flood pump stations



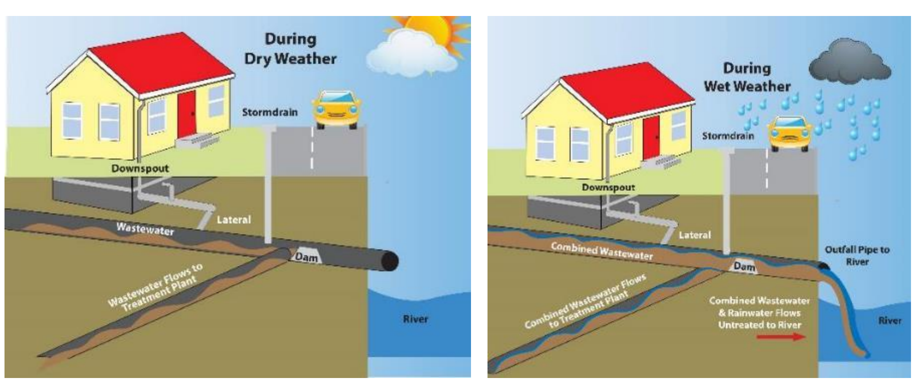
Unified Government's Sewer System

- 1/3rd Combined Sewer System
- 2/3rd Separate Sewer System



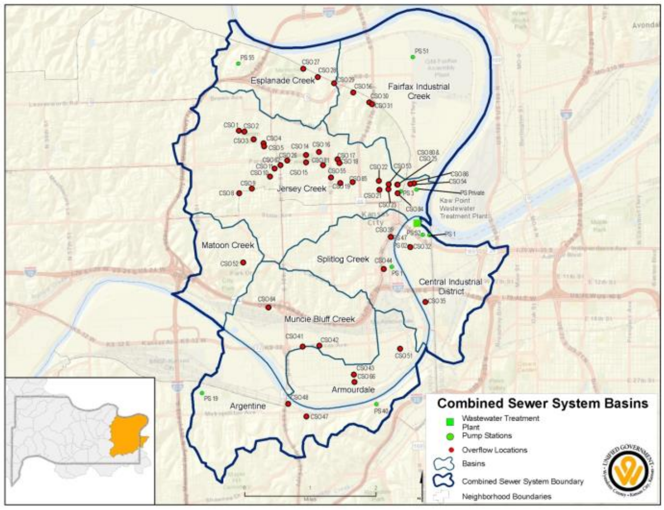
Combined Sewer Systems

- Sewage to Treatment Plant
- Diluted Sewage Overflows



- Overflows = bacteria + litter & debris from streets

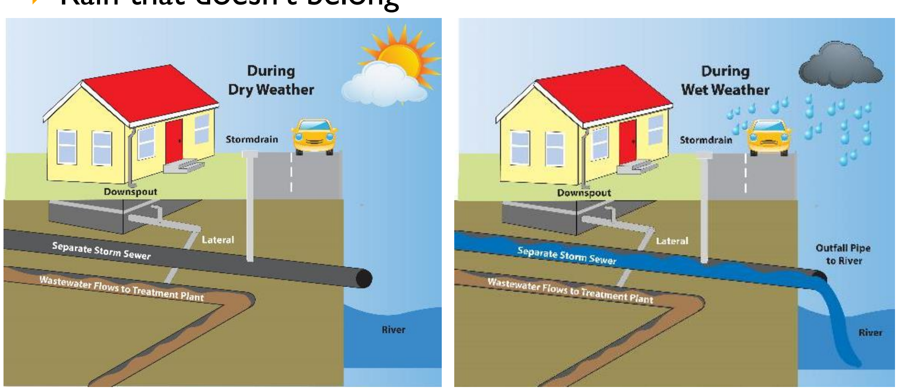
Combined Sewer Overflows



-

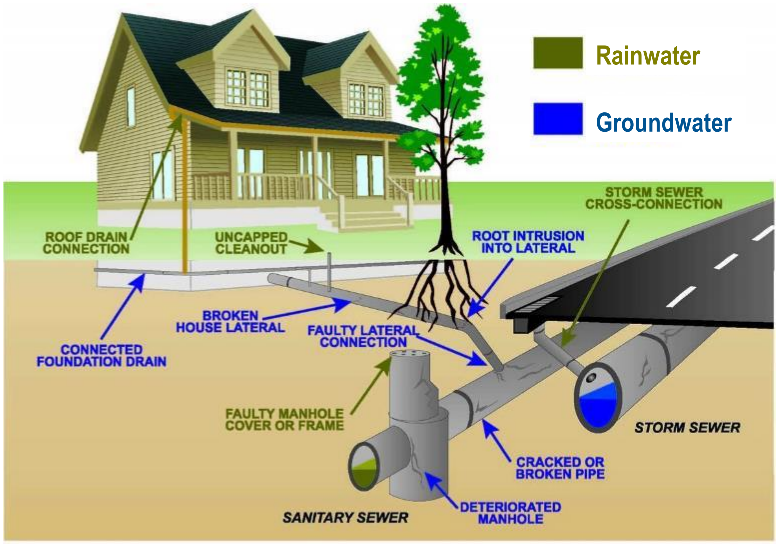
Separate Sewer System

- Rain that doesn't belong

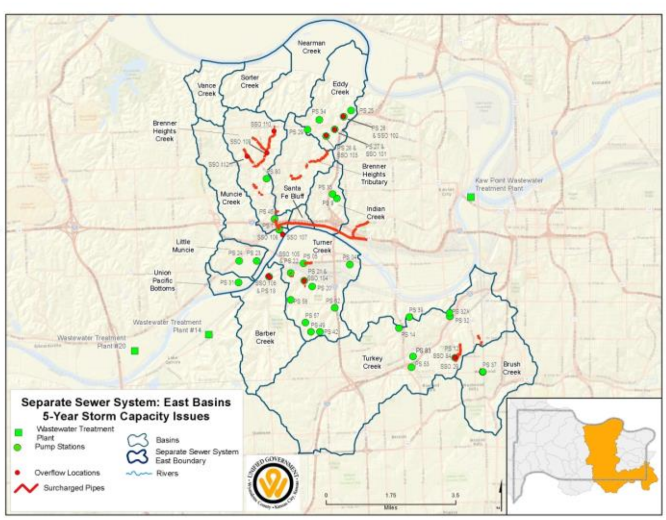


- Backs up sewage into buildings and overflows into local waterways
-

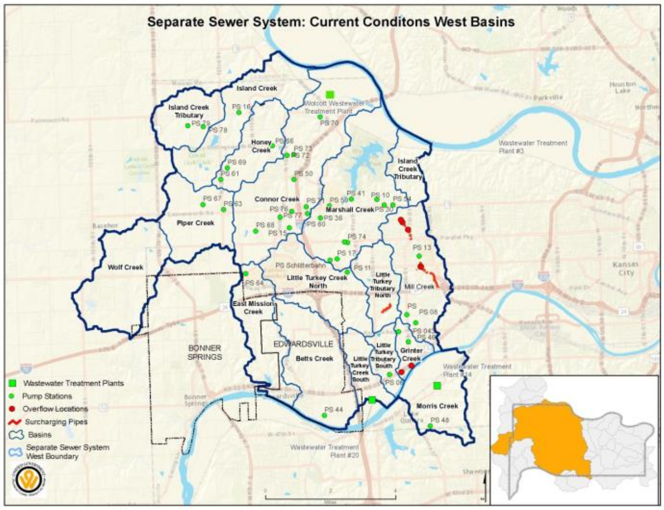
Rainwater & Groundwater Doesn’t Belong in Wastewater Pipes



Separate Sewer System (East)



Separate Sewer System (West)



Overflows Are the Issue

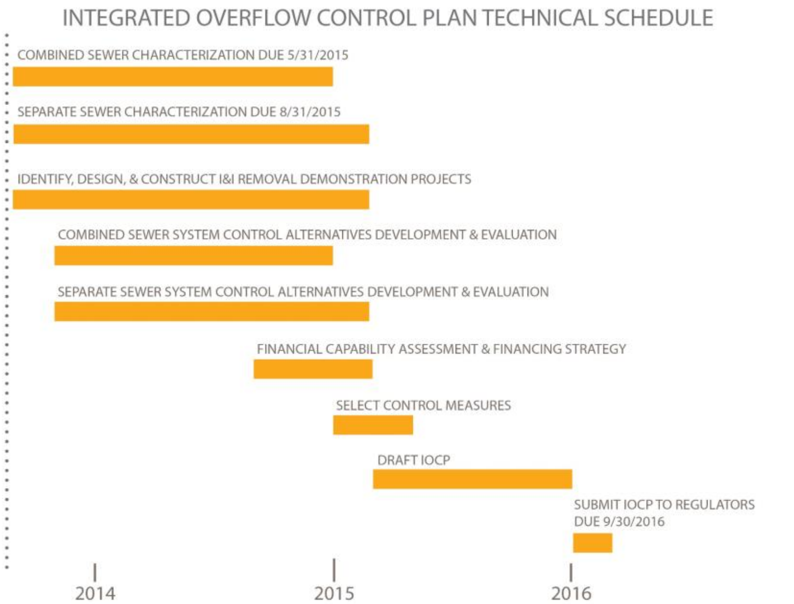
- Overflows are releases of untreated, diluted sewage into the environment
  - Bacteria
  - Litter
  - Debris

Local Receiving Waterways

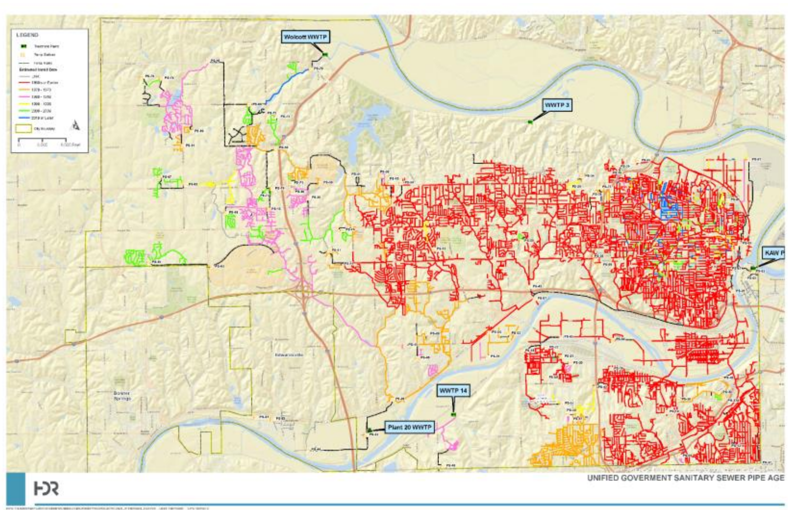
- Kansas River
- Missouri River
- Matoon Creek
- Jersey Creek

Integrated Overflow Control Plan

- What is the Unified Government doing to address overflows and protect water quality?
  - Continued Maintenance
  - Planning Studies
  - Revised Plan Due Sept 2016
  - Soliciting Input



Our Aging Sewer System



Broken Pipes Allow Water to Enter the System

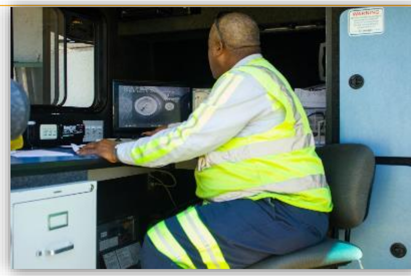
Roots Crack Pipes and Cause Leaks

Work Underway

- Pipe Maintenance
- Field Investigations
- Rainwater/Groundwater Reduction
- Sewer Pipe Repairs
- Sewer Manhole Repairs
- Pump Station Improvements
- Treatment Plant Improvements

Maintain System

Closed Circuit TV to find problems

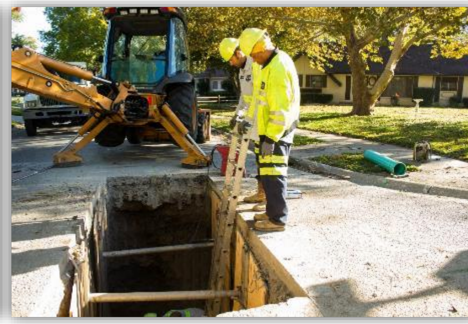



Smoke Testing to find problems



Public Sewer Rehabilitation

- Repair deteriorating pipes
- Replace broken manholes



Cured-In-Place Pipe Repair

- Line pipe with plastic resin
- Less disruption than replacing a pipe
- Extends life of pipe

Manhole Rehabilitation

- Tighten up to keep water out

Pump Station Improvements

Treatment Plant & Pump Stations Improvements

Funding

- Ratepayers are making a substantial reinvestment in our aging infrastructure to:
  - reduce overflows
  - renewal of assets
  - enhance our community
  - protect water quality
- Much work is left to be done and the longer it is delayed, the greater the need and cost becomes.
- Financial Capacity will be considered when negotiating with regulators

Questions?

- To learn more about Unified Government's Integrated Overflow Control Plan:
  - **Visit:** www.wycokck.org/pw
  - **Email:** iocp@wycokck.org
  - **Call:** (913) 573-5700

Integrated Overflow Control Plan Community Task Force - Meeting #2

January 29, 2016 11:00 a.m. – 1:00 pm.
Location: Wastewater Treatment Plant #20

Agenda

- Welcome and Meeting Purpose
- Partial Consent Decree
- Level of Control and Service
- Existing System Condition and Performance
- Financial Capability
- Additional Challenges
- Community Survey Discussion

Partial Consent Decree

Regulations

- Clean Water Act (1972)
- CSO Control Policy (1994)
- NPDES Permits
- MS4 Permit

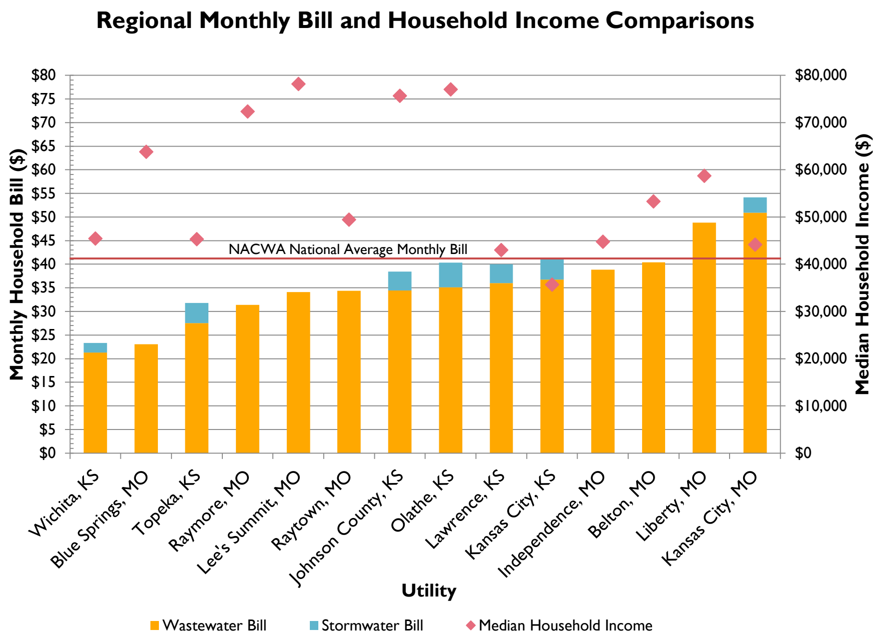
CSO Communities in US

CSO Long-Term Control Plan (2000)

- September 1996
  - *KDHE issues NPDES Permit requiring CSO compliance*
- November 2000
  - *CSO Long-Term Control Plan submitted*
- August 2001
  - *First sewer separation project began (Jersey Creek)*
- January 2007
  - *CSO Long-Term Control Plan considered inadequate by EPA*

Early Efforts

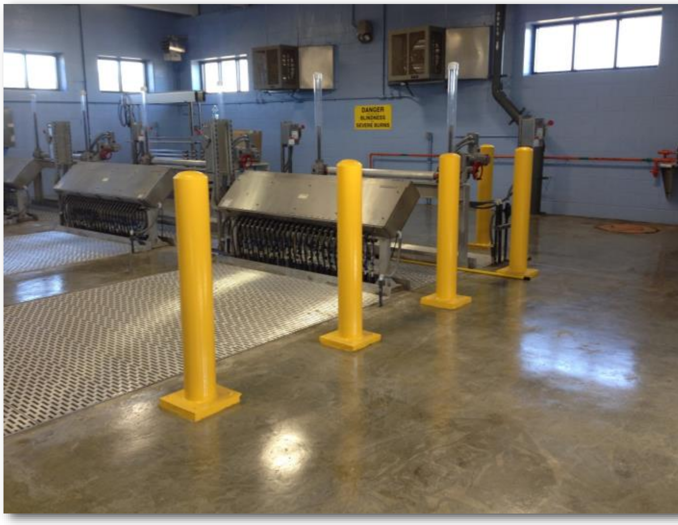
- Pipe Maintenance
- Field Investigations
- Sewer Pipe Repairs
- Sewer Manhole Repairs
- Sewer Separation Projects
- Pump Station Improvements
- Treatment Plant Improvements



Partial Consent Decree History

- Initiated by EPA in 2008 - Alleged Violations of the Clean Water Act
  - *NPDES Permit*
  - *MS4 Permit*
  - *Dry weather CSOs and constructed SSOs*
  - *Inadequate CSO LTCP and SWMP*
- Became effective May, 2013
- Requires (new) Integrated Overflow Control Plan submittal by September 2016

PCD Early Action Projects and Programs



Partial Consent Decree Compliance

Partial Consent Decree Submittal	Required Submittal Date	Submittal Status
IMGA and IMS Plan	September 30, 2013	Submitted Early
Implement Stormwater Management Plan	May 20, 2013	Submitted Early
Standard Operating Procedures	March 31, 2013	Submitted On Time
Adopt Legal Authority for SWMP	June 30, 2014	Submitted Early
Provide SWMP Funding Information	February 15, 2014	Submitted On Time
Adopt Legal Authority for FOG Program	July 1, 2014	Submitted Early
CMOM Plan	September 30, 2014	Submitted On Time
SSE Work Plan	March 15, 2013	Submitted On Time
Complete PCD Stipulated Projects	Varies	**On Schedule**
Review Abandonment Policy for Sewer Services Program	February 15, 2015	Submitted On Time
CSS Characterization Plan	May 31, 2015	Submitted On Time
SSS Characterization Plan	August 31, 2015	Submitted On Time
Integrated Overflow Control Plan	September 30, 2016	**On Schedule**

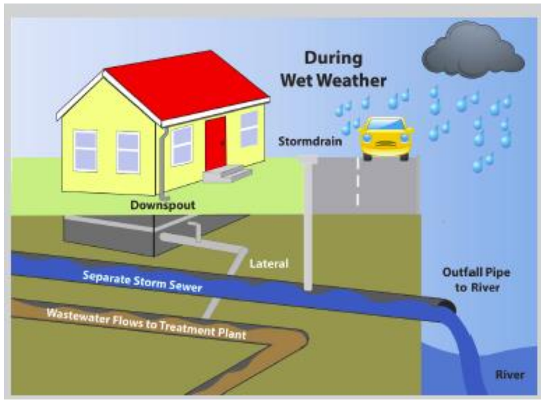
Level of Control and Service

Design Storm & Design Year

- The more it rains, the more diluted sewage will overflow into nearby rivers, lakes, and streams.
- The less overflows we allow, the more money it will cost to fix the wastewater system.
- SSOs – Design Storm
  - Regulators use the size of the storm event
- CSOs – Design Year
  - Regulators select a certain year and calculate the volume and number of overflows that occur each year

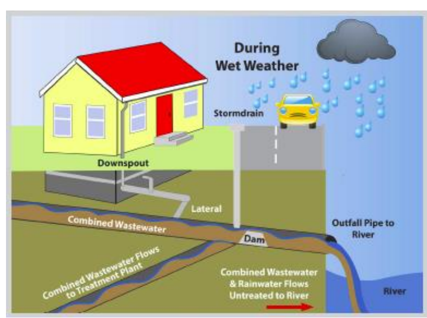
Level of Service (SSS)

- 0 overflows for a particular design storm
  - Ex: 0 overflows for a 2-year design storm

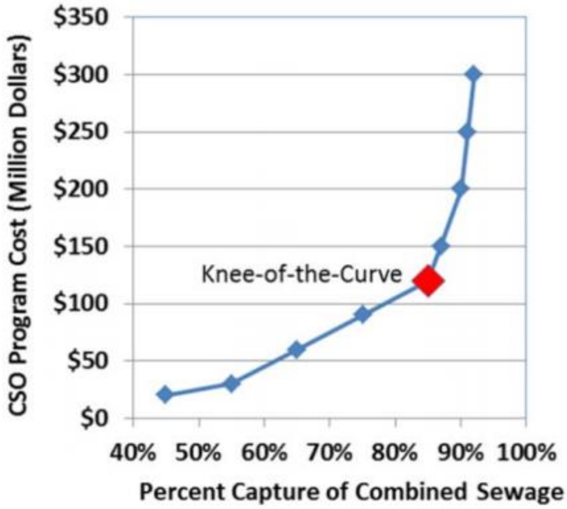


Level of Control (CSS)

- Number of overflow events during the design year
  - Ex: 4 overflow events during the design year
- Amount of combined sewage collected during wet weather during the design year
  - Ex: 85% capture during the design year



"Knee-of-the-Curve"



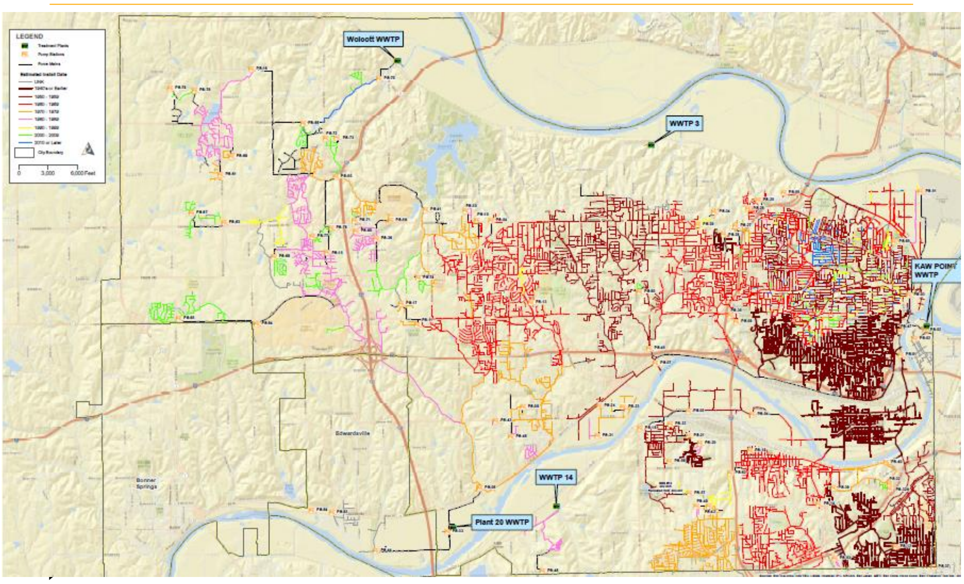
Existing System Condition and Performance

ASCE Report Card

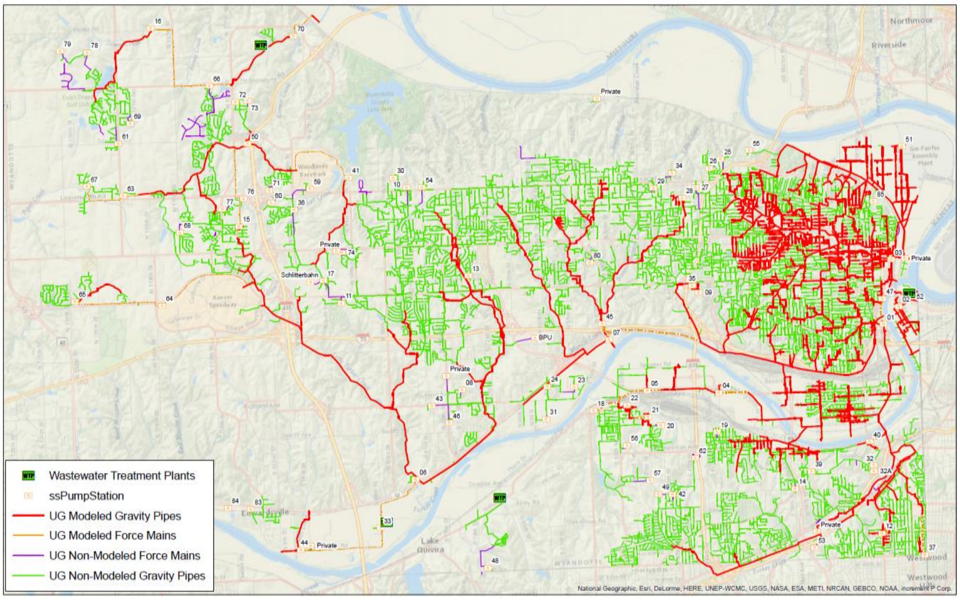
Infrastructure Condition Assessment

High-Risk Assets

Sewer Pipe Age



Modeled vs. Non-Modeled Pipes



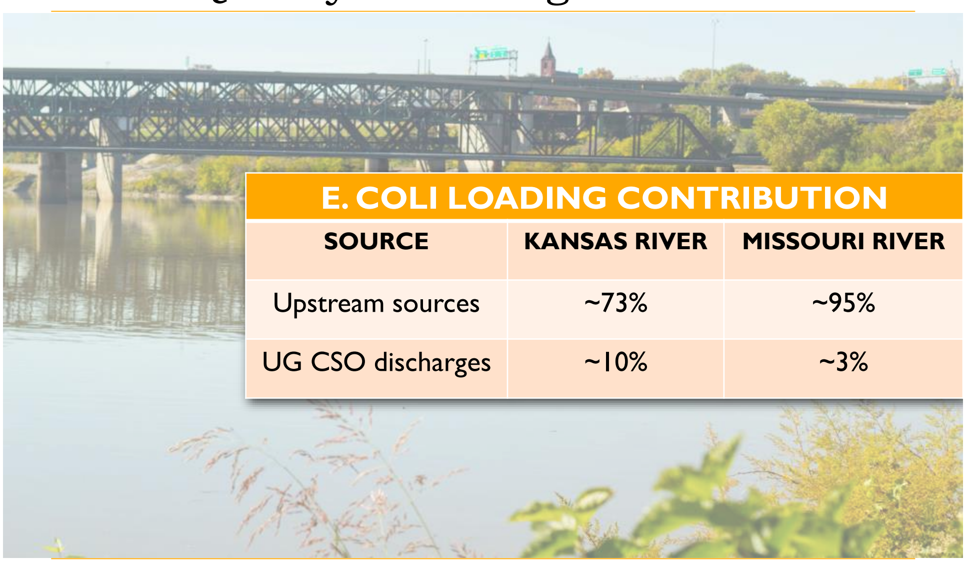
Combined Sewer System Characterization

- The EPA asked UG to review improvements at a level of control between 0 and 12 overflows per year
- The results:
  - 0 overflows | ≈ $1 billion
  - 12 overflows | ≈ $237 million

Separate Sewer System Characterization

- Separate sewer overflows are not permitted
- The EPA asked UG to review improvements at a level of control between 2-year and 5-year storms
- The results:
  - 2-year storm | ≈ $87 million
  - 5-year storm | ≈ $131 million

Water Quality – Existing Conditions



E. COLI LOADING CONTRIBUTION		
SOURCE	KANSAS RIVER	MISSOURI RIVER
Upstream sources	~73%	~95%
UG CSO discharges	~10%	~3%

Water Quality – Existing Conditions

WQS Compliance During 7-Month Recreation Season

- Existing Conditions
  - 2 months
- Remove All UG CSO Discharges
  - 2 months
- Remove Upstream Loading
  - 7 months

Financial Capability

Financial Capability Assessment

- Indicates degree of financial burden associated with Clean Water Act compliance
- Guidelines established by the EPA's *Combined Sewer Overflows – Guidance for Financial Capability Assessment and Schedule Development, 1997*
- Results interpreted through a matrix comparing the Financial Capability Indicator (**FCI**) and Residential Indicator (**RI**)

FCA Matrix

- Financial Capability Indicator (**FCI**)
  - What financial ability does the community have to support the proposed program
- Residential Indicator (**RI**)
  - How much will the wastewater bill be as a % of Median Household Income

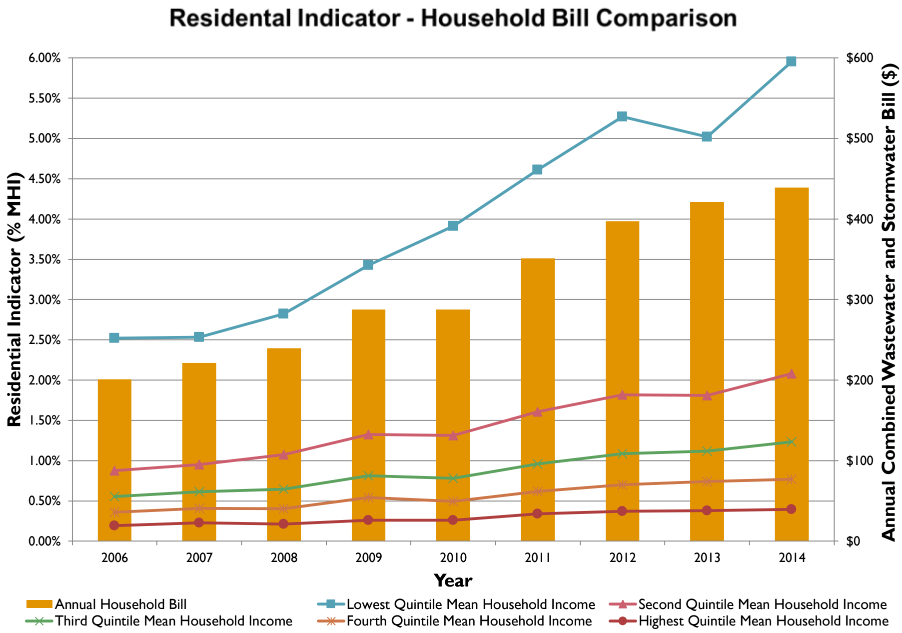
Financial Capability Indicator Score	Residential Indicator		
	Low (Below 1%)	Mid-Range (1%-2%)	High (Above 2%)
Weak (Below 1.5)	Medium Burden	High Burden	High Burden
Mid-Range (1.5 - 2.5)	Low Burden	Medium Burden	High Burden
Strong (Above 2.5)	Low Burden	Low Burden	Medium Burden

Revised FCA Framework

- Released in late 2014, recognizes integrated planning and illustrates flexibility in the interpretation of FCA results
- Key Elements
  - Ability to submit additional information to tell each community's unique story
  - Interpretation of the FCA matrix should be viewed as a continuum
  - All CWA costs may be included in assessing impact
  - Stopped short of full recognition of SDWA costs

Considered Criteria

- Unemployment Rate
- Median Household Income
- Health Insurance Coverage
- Poverty Level
- Renter-Occupied Housing Units
- Hispanic-Latino Population
- Black or African-American Population
- Debt Burden Per Capita



Additional Challenges

Additional Challenges

- Flood control
- Future regulatory compliance requirements
- Loss of utility management experience and institutional knowledge
- Growth
- Other City priorities

Community Survey Discussion

Community Survey Discussion

- Survey Overview
- Task Force Member Input
- Community Survey Distribution
  - Livable Neighborhoods
  - Neighborhood Associations
  - Paper copies distributed

Thank You!

Questions: Contact Erin Dougherty at
ErinD@shockeyconsulting.com or 913.248.9585

Integrated Overflow Control Plan Community Task Force - Meeting #3

February 19, 2016 11:00 am – 1:00 pm
Location: Reardon Center Eisenhower Room

Agenda

- Welcome and Meeting Purpose
- Preliminary Findings Review and Discussion
- Proposed Plan
- Community Survey and Outreach Methods

Preliminary Findings Review and Discussion

Goals

- Protect human health, public safety, and property
- Meet regulations
- Protect water quality based on how the community wants to use water resources


**Developed during June 2014 strategic planning session*

Priorities

- Reinvest in our existing system
- Address chronic, high frequency SSOs
- Achieve multiple benefits

**Developed during June 2014 strategic planning session*

Combined Sewer Overflows (CSOs)

- Overflows at outfalls
- ***Diluted*** sewage
- Required to ***reduce***

Separate Sewer Overflows (SSOs)

- Overflows through manholes or basement backups
- ***Concentrated*** sewage
- Required to ***eliminate***

Conforming Overflow Control Plan

Level of Control (CSO)	< 4 CSOs/year
Level of Service (SSO)	0 SSOs
Schedule	20 years
Financial Burden	2% Median Household Income

Preliminary Findings Review

- Community Profile
- Financial Capability
- Infrastructure Renewal Needs
- Sewer System Characterization
- Water Quality
- Additional Challenges and Needs

Conclusion

Proposed Plan

Our Plan

- Adaptive
- Affordable
- Aggressive
- Addresses existing system
- Achieves multiple benefits

Proposed Plan Phases

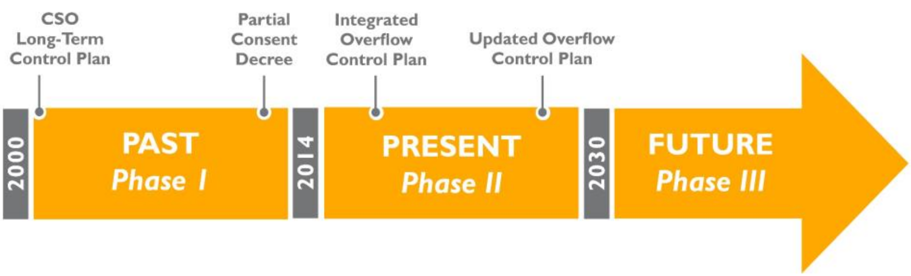
Commitment Metric	Overflow Control Plan	Capital Improvements Plan		
	Conforming	**Phase I (2000 – 2013)**	**Phase II (2014 – 2029)**	**Phase III (2030 – ?)**
Level of Control (CSO)	< 4 CSOs/year	Minor Reduction	Minor Reduction	?
Level of Service (SSO)	0 SSOs	Minor Reduction	Significant Reduction	?
Schedule	20 years	14 years	16 years	? years
Financial Burden	2% MHI	0.54% to1.11% MHI	1.23% to1.65% MHI	?% MHI

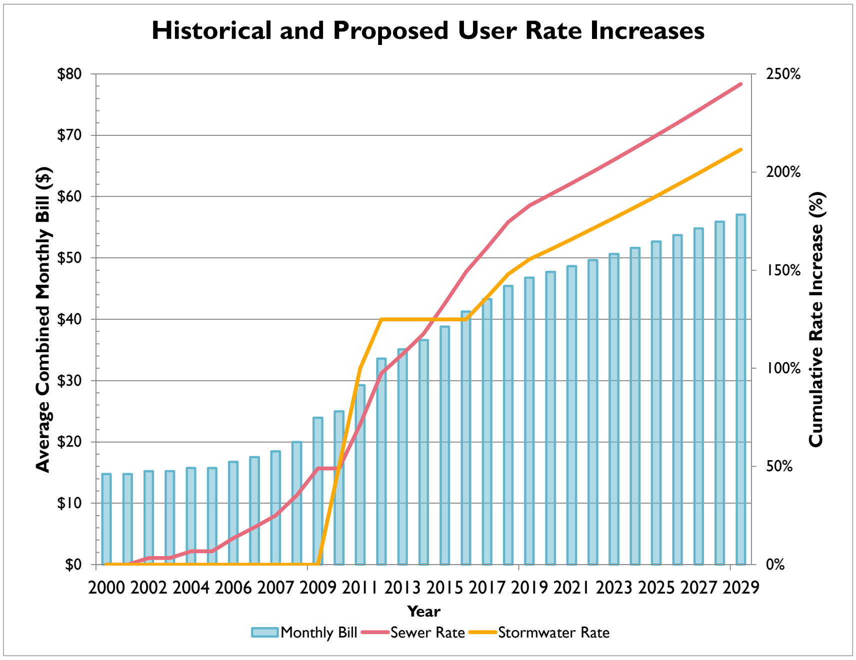
The Proposed Plan will allow us to:

- *"sufficiently evaluate system performance and condition to ensure more informed planning decisions are made for capital improvements, and*
- *develop internal capabilities to replace organizational strength and institutional knowledge lost due to recent (and anticipated) retirements, as well as*
- *be able to support ongoing program activities to maximize cost effectiveness."*

-Trenton Foglesong, Director
Water Pollution Control Division

Proposed Plan Schedule

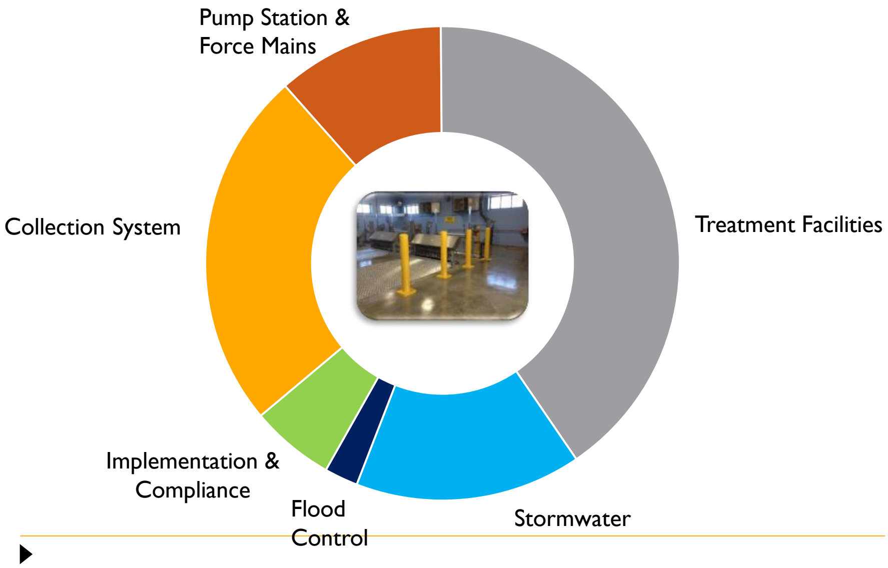




Proposed Plan – Household Impact

Financial Metric	2000	2014	2029
Combined (Wastewater + Stormwater) Monthly Bill	$14.75	$36.60	$57.05
Median Household Income	$33,011	$35,724	$41,476*
Residential Indicator (% of MHI)	0.54%	1.23%	1.65%

Capital Improvements



Wolcott Wastewater Treatment Plant

- Reduces sewer overflows
- Reclaims and increases capacity in our system
- Eliminates operation and maintenance costs at Pump Station 20
- Supports future growth and development

- Reinvest in our existing system
- Address chronic, high frequency SSOs
- Achieve multiple benefits

Annual Investigation and Repair

- Addresses failing infrastructure
- Improves system reliability
- Prevents excess rainwater from entering our system
- Reclaims and increases capacity in our system
- Reduces sewer overflows

- Reinvest in our existing system
- Address chronic, high frequency SSOs
- Achieve multiple benefits

System-Wide SCADA Improvements

- Replaces old technology
- Improves monitoring capabilities
- Optimizes the existing system
- Reduces overflow response time
- Improves planning and reporting

- Reinvest in our existing system
- Address chronic, high frequency SSOs
- Achieve multiple benefits

Green Infrastructure in Jersey Creek

- Reduces sewer overflows
- Prevents excess rainwater from entering our system
- Reclaims and increases capacity in our system
- Determines cost and effectiveness for future planning
- Provides aesthetic value to the community

- Reinvest in our existing system
- Address chronic, high frequency SSOs
- Achieve multiple benefits

Continued Program Implementation and Enhancement

- Reduces sewer overflows
- Improves system reliability
- Maintains existing pipes and facilities
- Optimizes the existing system

- Reinvest in our existing system
- Address chronic, high frequency SSOs
- Achieve multiple benefits

Next Steps

- KDHE Support
- Task Force Input and Support
- Unified Government Support
- EPA Feedback
- Public Input and Support

Community Survey and Outreach Methods

Community Survey

- Objectives
- Revisions
    - Visual narrative
    - Additional background information
- Distribution

Community Survey

What Does Community Engagement Look Like for Our Plan?

- Methods
    - Road Shows
    - Newsletters
    - Community Events

WE WELCOME YOUR IDEAS AND INPUT

Thank You!

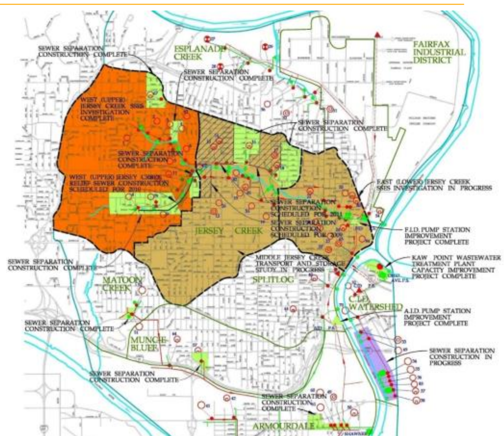
Questions: Contact Erin Dougherty at
ErinD@shockeyconsulting.com or 913.248.9585

Integrated Overflow Control Plan Community Task Force - Meeting #4

March 30, 2016 11:00 am – 1:00 pm
Location: Kaw Point WWTP

Early Efforts (2000-2013)

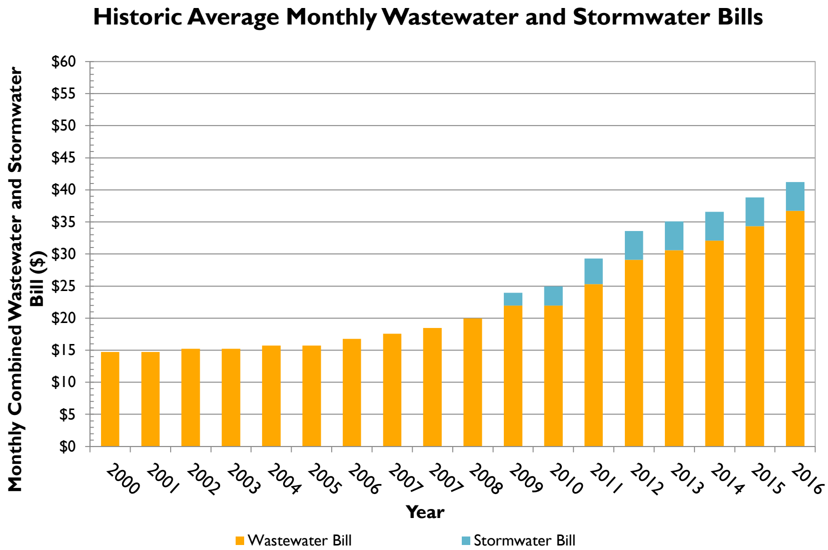
- CSO Long-Term Control Plan Projects
  - Jersey Creek sewer separation
  - Pump station improvements
  - Treatment plant improvements
- Field investigations and monitoring
- Rehabilitation and repair
- Maintenance
- Improved overflow awareness, response, and tracking
- MS4 Program



Reduced number of CSO outfalls from 66 to 39 and annual overflow volume by almost 20%

2

Early Effort Funding



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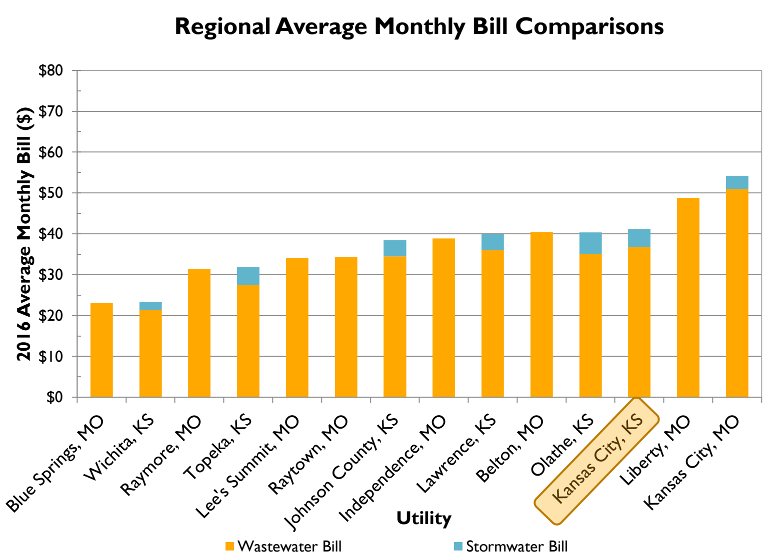
Regional Rate Competitiveness



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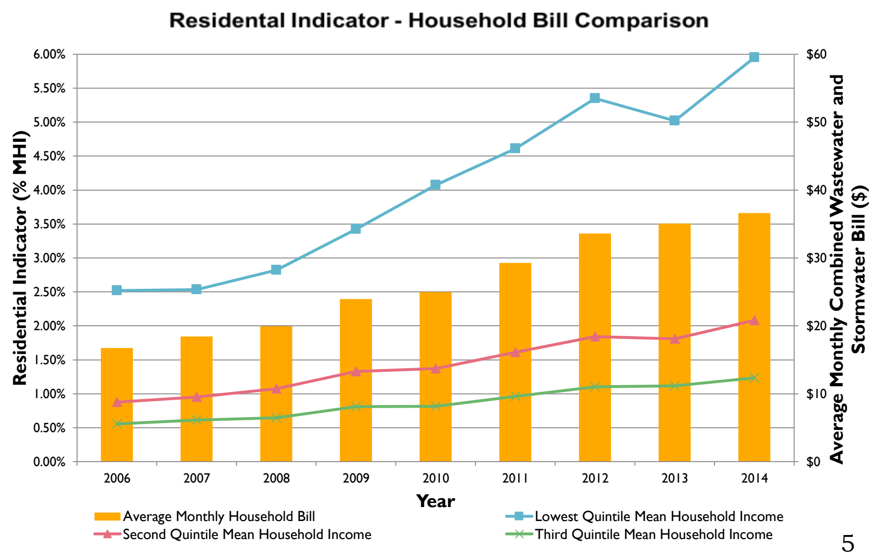
Household Financial Burden



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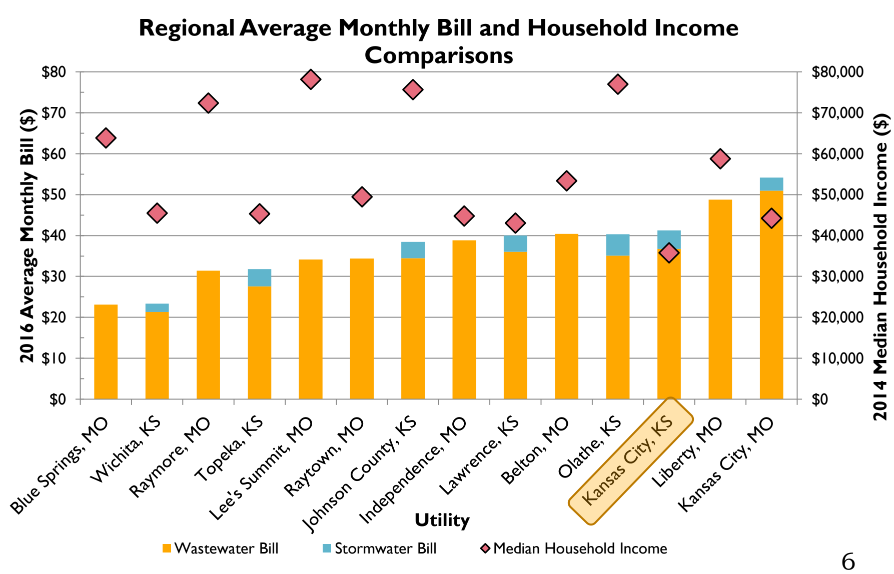
Regional Comparisons



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Proposed Plan Options

Program Components	Existing Conditions (2014)	CSO Control Policy	Option Presented to EPA/DOJ (March 2nd)	Option A	Additional Options
Program Length	-	≤25 years	14 years	10 years	25 years
Level of CSO Control	72% wet weather capture 50 events/year Demonstration approach	≥85% wet weather capture <6 events/year Demonstration approach	76% wet weather capture 50 events/year Demonstration approach	76% wet weather capture 50 events/year Demonstration approach	76% to 85% wet weather capture 12 to 50 events/year Demonstration approach
Residential Indicator (% of MHI)	1.23%	2.0%	1.65%	1.7%	1.94% to 2.44%
Combined (Wastewater + Stormwater) Monthly Bill	$36.60	$77.51	$57.05	$56.46	$74.20 to $94.25

Integrated Overflow Control Plan Community Task Force Meeting #5

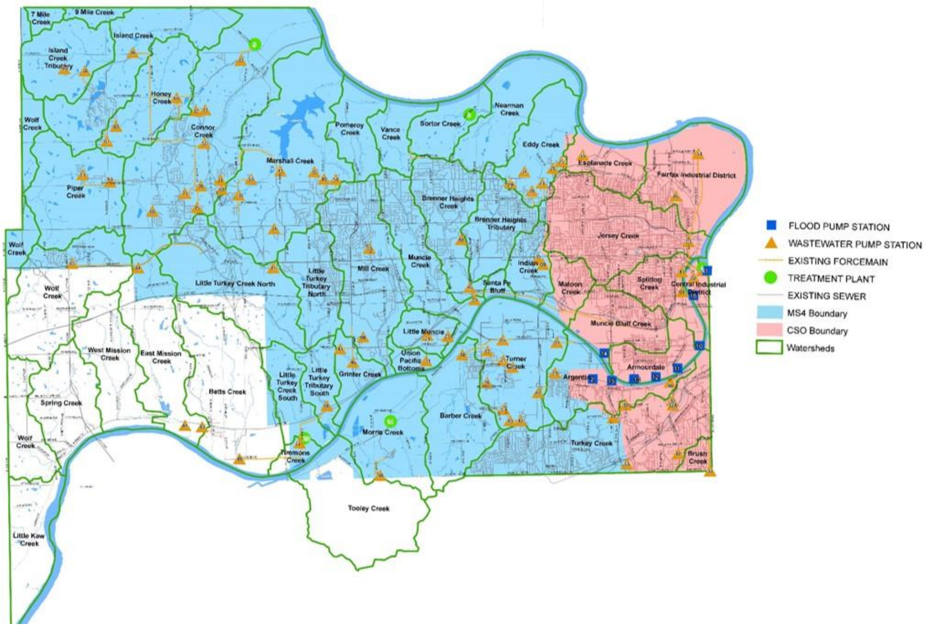
August 9, 2016

Agenda

- What's the problem?
- What's the plan?
- How does this impact my sewer bill?
- How can I help?
- What did we hear?

What's the problem?

Our Sewer System



Aging Infrastructure

- Leaking Pipes
- Basement Backups
- Collapsed Pipes




Plan Required

- All of our work is regulated by the EPA and KDHE under the Clean Water Act (1972)
- Kansas City, like many major cities, is required to dramatically reduce sewer system overflows
- We are recommending a plan that makes continued progress towards meeting the goals of the Clean Water Act

Progress Since 2000

- Major projects to reduce overflows
- Field investigations and monitoring
- Rehabilitation and repair
- Maintenance

Reduced number of locations from 66 to 48 (39 outfalls)

Decreased annual overflow volume by almost 20%!

What's the plan?

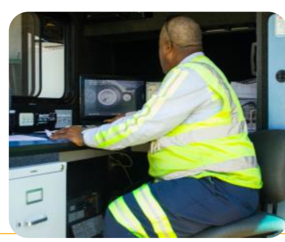
Proposed Schedule

Community Input

- 24 Presentations to Neighborhood Groups
- Community Task Force
- Community Survey
- 3 Public Meetings
- Website
- Brochures
- Video

Recommended 10-Year Plan

- Focusing on fixing the pipes and facilities that we already have
- Learning more about how our system works so that we can make smart decisions
- Working toward reducing overflows to improve water quality and protect public health

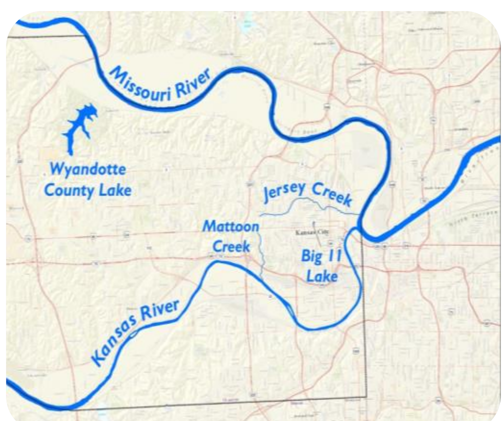


Recommended $200 Million Plan

- Investigate and repair existing sewer pipes
- Upgrade technology throughout facilities to monitor the system
- Construct a new wastewater treatment plant
- Reduce rainwater getting into combined sewers by repairing pipes and installing green infrastructure
- Increase maintenance of existing sewer pipes and facilities

Waterways Where Combined Sewers Overflow

- Kansas River (7 outfalls)
- Missouri River (6 outfalls)
- Mattoon Creek (2 outfalls)
- Jersey Creek (24 outfalls)



Modeled Combined Sewer Overflow Reduction

Annual Overflow Volume Measured in Millions of Gallons

Water Body	Existing Condition (2000)	Existing Condition (2013)	Recommended Plan (2025)	Future Plan (?)
Missouri River	643	479	450	203
Kansas River	388	365	225	137
Jersey Creek	152	69	55	45
Mattoon Creek	.14	.14	.14	.14
TOTAL	**1,031**	**844**	**675**	**340**
Percent Captured During Wet Weather Flow	**66.6%**	**70.5%**	**73.1%**	**85%** Meets EPA recommended target

Under the Recommended Plan, we will decrease the annual CSO volume by 35%!

Modeled Sanitary Sewer Overflow Reduction

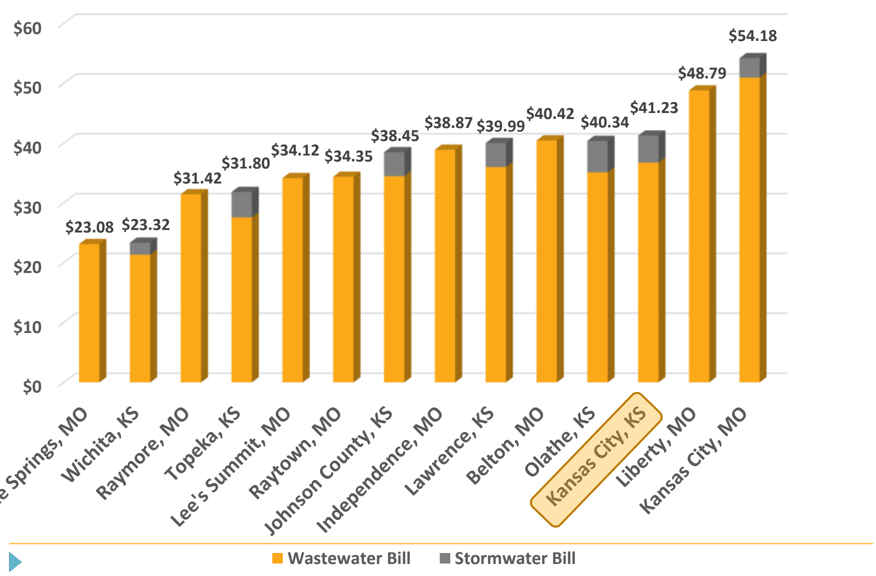
Two-Year Design Storm Overflow Volume Measured in Gallons

Existing Condition (2013)	Recommended Plan (2025)	Future Plan (?)
1,480,000	226,000	0
		Meets EPA recommended target

Under the Recommended Plan, we will decrease the Two-Year Design Storm SSO volume by 84%!

How does this impact my sewer bill?

Regional Bill Comparison



Projected Typical Monthly Bill

Your monthly bill will increase by about $2 each year for the next 10 years

Next Steps

- Approval of the Recommended Plan by UG Commissioners
- We will work with the EPA and Department of Justice to reach an agreement
- We believe our Recommended Plan is the most effective and affordable plan for our community

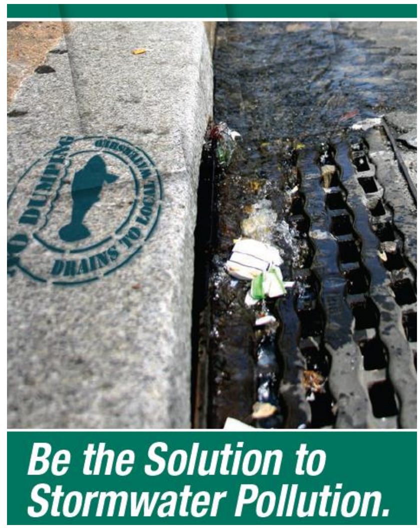
PLAN IS DUE
SEPTEMBER 30, 2016

How can I help?

See a problem? Call 913-573-5535

How can you protect your waterways?

- Rake away from curbside storm drains
- Wash your car in the grass or at a carwash
- Do not discard anything down a storm drain
- Pick up after your pets
- Help raise awareness

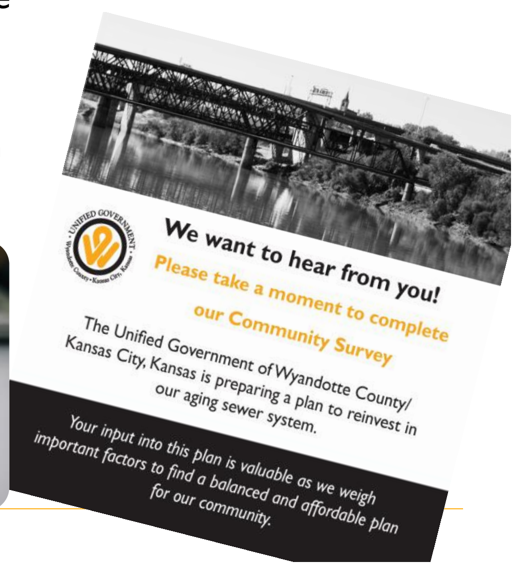


UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

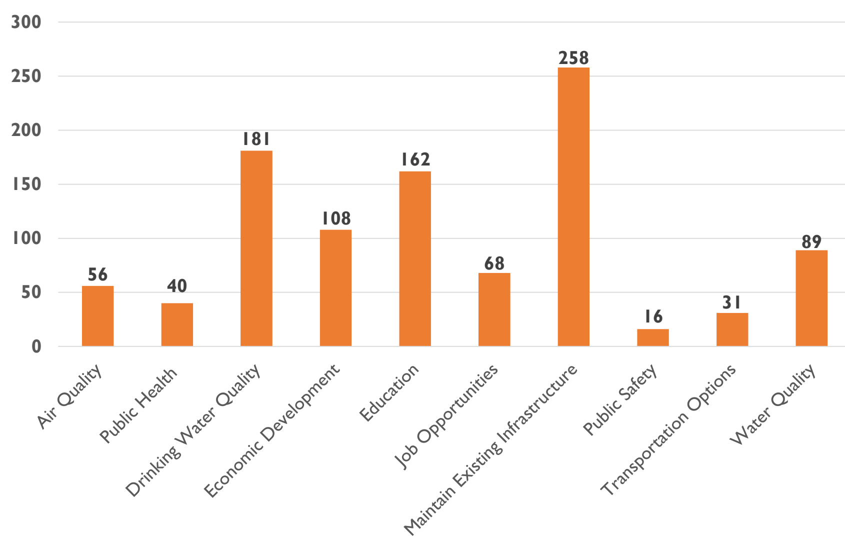
What did we hear?

What We Heard From You

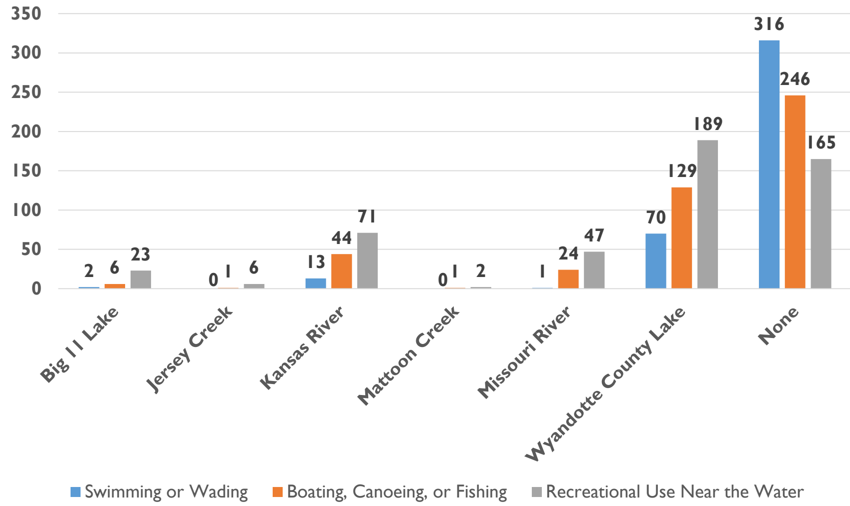
- Our community wants the most affordable plan
- Citizens want to see us focus on fixing the system we already have



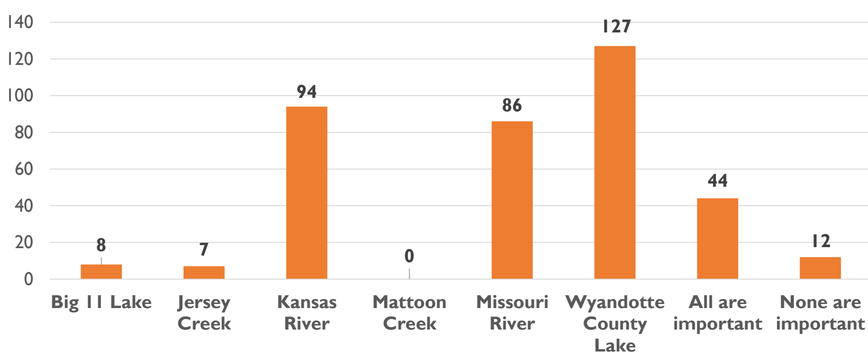
Community Priorities



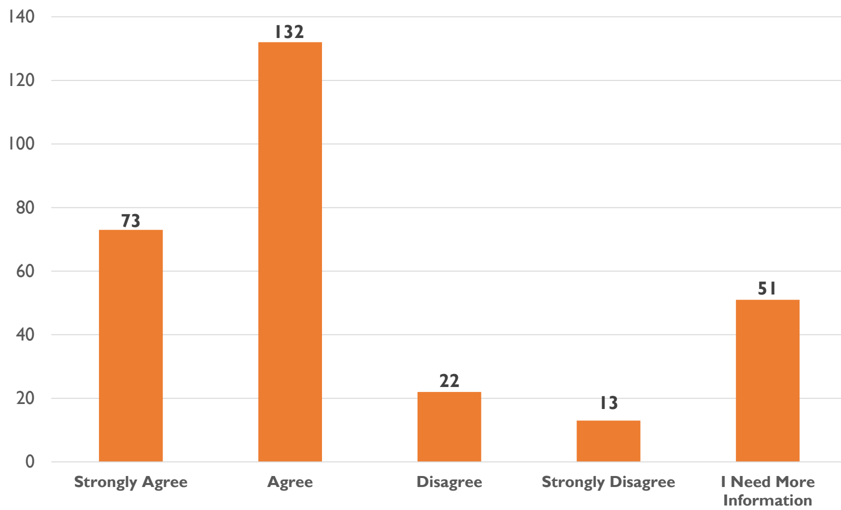
Water Body Use in Wyandotte County



Which Water Body is Most Important to Protect?



Should Wastewater Investments Consider the Financial Ability of Citizens?



Need More Information?

- **For questions or concerns:**
  - **Call (913) 573-1333**
  - **Email IOCP@wycokck.org**
- **Follow us for updates!**

@CityofKCK

Facebook.com/CityofKCK

For general information, visit our website: UGIOCP.com

Appendix H –

Community Task Force Recommendation Letter

Integrated Overflow Control Plan (IOCP)

Community Task Force

August 25, 2016
Mayor Mark Holland & Board of Commissioners:

We were appointed by you to provide input into the Integrated Overflow Control Plan. We met during 2015 and 2016 to learn about the various options to address our wastewater system issues and share our input with the technical team.

We support the Recommended Plan to

- Restore and enhance our existing sewer pipes and facilities where it is necessary and/or cost-effective to do so
- Validate how our system works so that we can make smart future investments
- Continue work toward reducing overflows to improve water quality

It is important to address important issues in a way that our community can afford and which will provide critical information for future water quality investments. Because this is a major infrastructure investment, we urge you to use those dollars to maximize the community benefits and employment opportunities for our citizens.

Phased Approach

Over the next decade, the Recommended Plan calls for the community to commit to a $200 million capital improvement plan to make continued progress toward rehabilitating our existing system and meeting Clean Water Act requirements.

We support the restoration of our wastewater system to a more sustainable condition over the next 10 years. It is important to measure these results along the way so that the Unified Government can be better positioned and informed to make additional commitments towards improving water quality.

Affordability is Important

It is particularly important for UG to spend each wastewater dollar wisely as our economically disadvantaged community is already facing many other critical infrastructure needs and socioeconomic challenges.

- Notably, Wyandotte County residents have the lowest per capital income, highest rate of unemployment, and lowest overall health ranking in Kansas. Also, compared to the national average, we have significantly lower median household income, higher percent unemployed, and more households with income below the poverty level.
- Our average wastewater/stormwater rates are already at $40 per month – one of the highest burdens in the region. If rates were any higher than the 10-year projected increase, they would negatively impact individual household budgets for decades, hurting those most unable to pay.
- It is essential that we keep rates affordable so that we do not hurt our community's ability to address other issues, and to retain and attract business activity.

Address Community Priorities

The Recommended Plan will address the community's highest priorities of renewing the existing infrastructure and make important progress towards meeting the goals of the Clean Water Act. We believe that our investments for improvements should be targeted in:

- Investigate and repair existing sewer infrastructure across the community
- Upgrade technology throughout facilities to better monitor the system
- Construct a new wastewater treatment plant to substantially reduce overflows and accommodate new ratepayers
- Reduce rainwater getting into combined sewers by rehabilitating sewer pipes and installing green infrastructure
- Increase maintenance of existing sewer pipes and facilities

The improvements planned for the next ten years are identical to the improvements that would be implemented during the first ten years of a typical 25-year plan. This 10-year commitment is only a piece of our phased approach toward meeting the overall goals of the Clean Water Act.

Employment Opportunities for Our Citizens

It is important to us that the Unified Government keeps this large-scale infrastructure investment within our community by positioning Wyandotte County citizens for future job opportunities related to the Integrated Overflow Control Plan. The IOCP must also deliver the greatest benefits possible to our citizens given the hundreds of millions in local dollars that will be invested.

Thank you for placing your confidence in us to sort through options and provide our views on the right plan for our community.

Donald Brooks Donald Brooks

Former Unified Government Public Works employee, Security Bank

Dawn Buehler D Buehler

Kansas River Keeper, Friends of the Kaw

Richard Mabion Richard Mabion

President of Kansas City, Kansas NAACP and Kansas Sierra Club Board Member

Monica Mendez ______________________________

Community Mobilizer and involved in the Latino Health Initiative

Nozella Brown – *Provided input into Community Task Force discussions but due to her current position with the Kansas State Research & Extension, she is not permitted to publicly advocate for a city decision or policy.*

Appendix I –

Road Show Presentations and Sign-In Sheets

Integrated Overflow Control Plan

January 22, 2015

*Ever wonder what happens **after** you flush?*

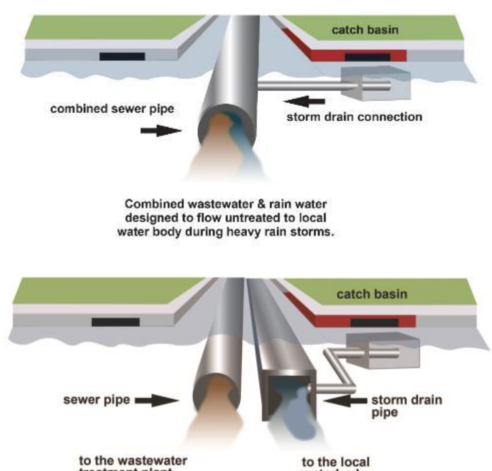
- If you live in the Unified Government, what should happen after you flush is a hot topic.

Wastewater System

- 158 Square Miles
- 150,000 area residents
- 5 wastewater treatment plants
- 800 miles of sewers
- 115 employees
- 83 wastewater pump stations & 9 flood pump stations

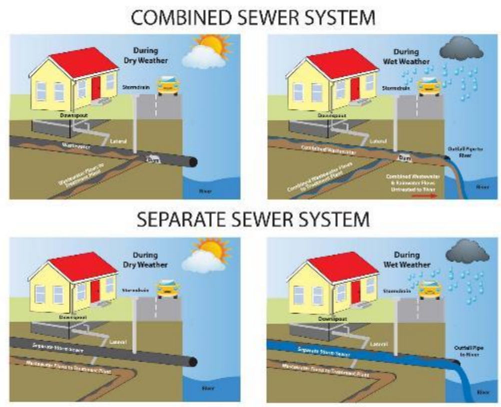
Unified Government's Sewer System

- 1/3rd Combined Sewer System
- 2/3rd Separate Sewer System

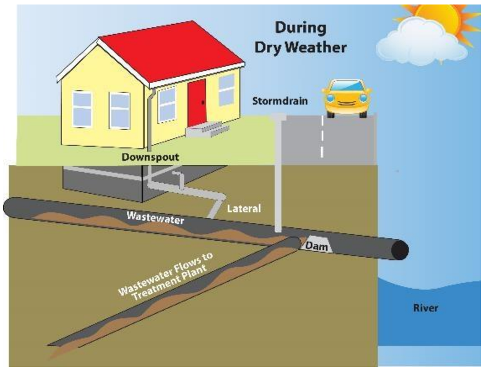


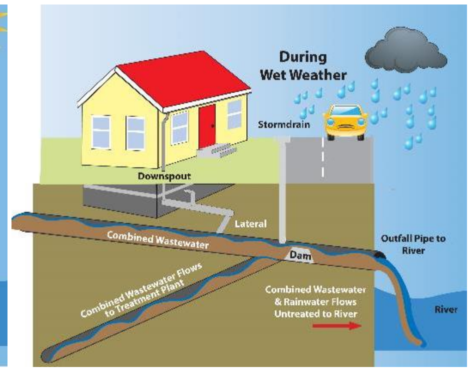
Sewer Overflows

- Combined Sewer Overflows (CSOs)
- Sanitary Sewer Overflows (SSOs)

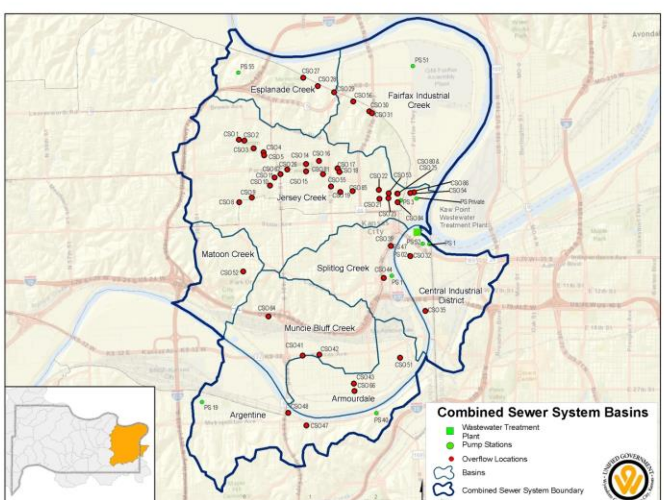


Combined Sewer Overflows

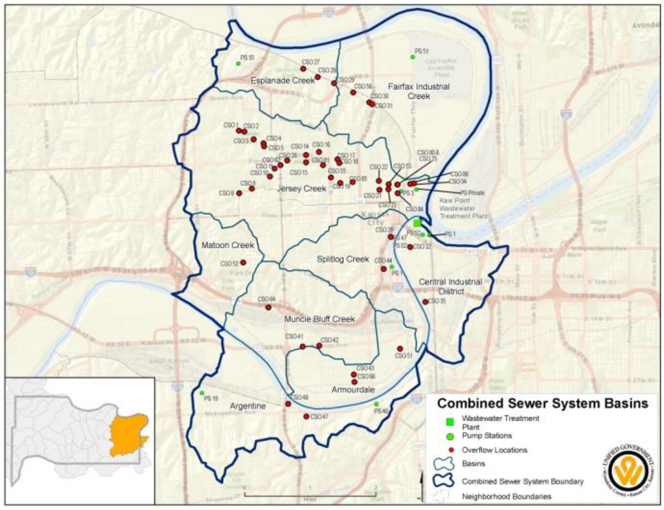




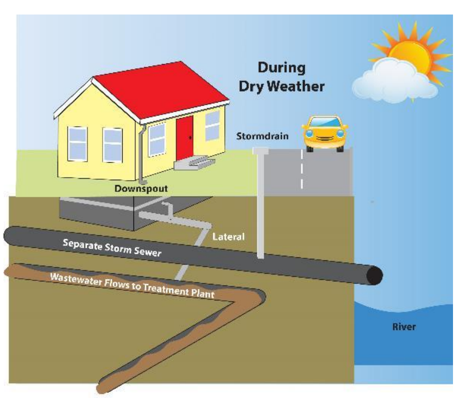
Combined Sewer Overflows

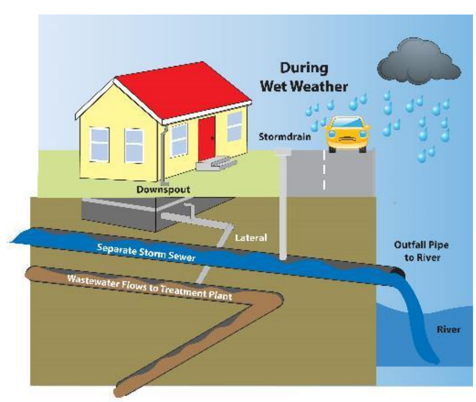


Combined Sewer Overflows Overview

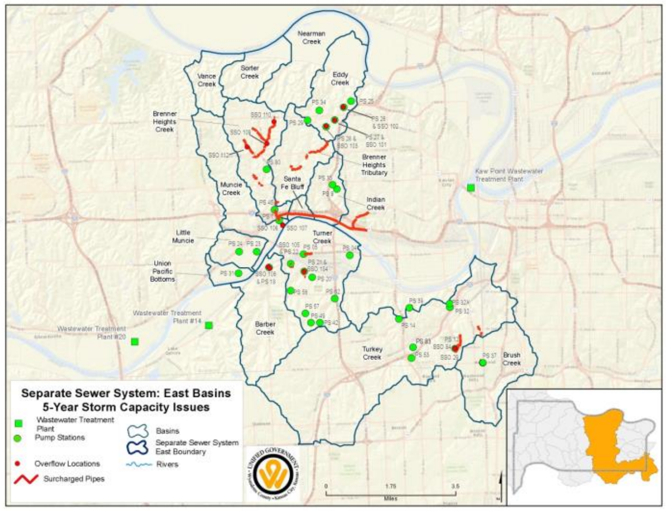


Separate Sewer System Overflows (SSO)

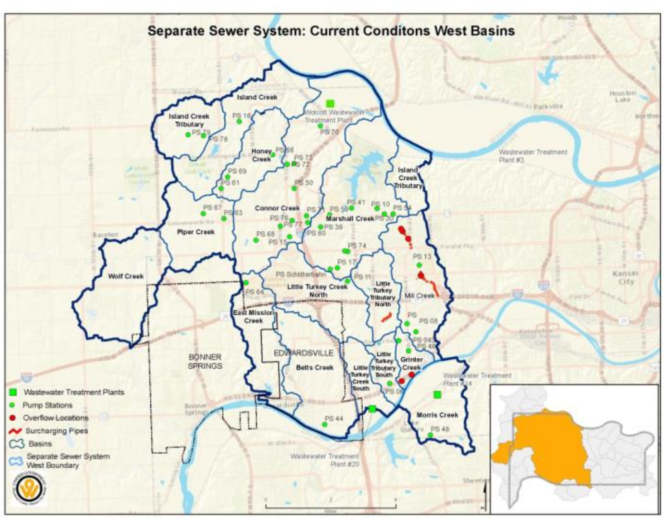




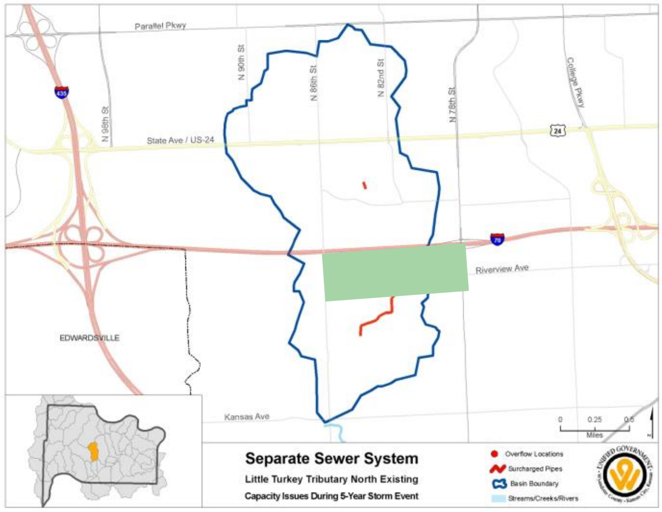
Separate Sewer System (East)



Separate Sewer System (West)



Little Turkey Creek North (Existing)



Regulatory Challenges

- Clean Water Act
- Consent Decree

Goals

- Protect human health, public safety, & property
- Meet regulations
- Protect water quality

Waterways being protected

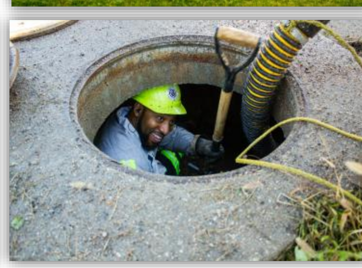
- Kansas River
- Missouri River
- Matoon Creek
- Jersey Creek

Integrated Overflow Control Plan

- What is the Unified Government doing to address overflows and protect water quality?

Work Underway

- Plant Improvements
- Pump Station Improvements
- Sewer Pipe repairs



Funding

- Wastewater rates
- Ratepayers are making a substantial reinvestment in our aging infrastructure to:
  - reduce overflows
  - create local jobs
  - enhance our community
  - protect water quality
- Much work is left to be done and the longer it is delayed, the greater the need and cost becomes.

Questions?

- To learn more about Unified Government's Overflow Control Plan,
  - **Visit:** www.wycokck.org/pw
  - **Email:** iocp@wycokck.org
  - **Call:** (913) 573-5700

Integrated Overflow Control Plan
Riverview Acres Crime Eliminators Presentation

January 22, 2015
7:00pm - 8:00pm

Riverview General Baptist Church
7924 Riverview Avenue
Kansas City, KS 66112

Your Name	Address	Phone Number	Email Address
Pat & Adriad Carnedy	307 N. 80th Terr	913-944-1844	
Pat + Earl Spencer	44 N. 80th Pl. KCKs 66111	913-788-7140	KCKSPAT@aol.com
Ruth Ann Taylor	300 N. 81 Terr	913-299-3650	NONE
Jim + Camile Adrox	221 N 81st terr Kck 66112	913-400-2154	NONE
Jennifer Pagacz	324 N 80 Ter Kck 66112	913 636 5148	JJLTA@msn.com
Jim Storm	301 N. 81 St. Ter	913-334-3142	
OFFICER TOMS	4951 STATE KCK	913 573 8703	HTOMS@KCKPD.ORG
SGT. Lehmanske 1625	4951 State Kck	913 573-8712	dlehmanske@kckpd.org
Pamela Stark	215 N. 80 Terr	816 810 8451	pammipnda@aol.com
Chris Collins	8248 Riverview	913-486-8502	—
Vic Whitney	8030 Northrup Ave	913-299-2545	—
Scott Lemmon			scotts4x4@kc.rr.com

Integrated Overflow Control Plan

February 12, 2015

Highlights

- Major upgrades will be coming to our sewer system
- We will preserve our system and continue protecting our rivers and lakes
- We appreciate your time and input

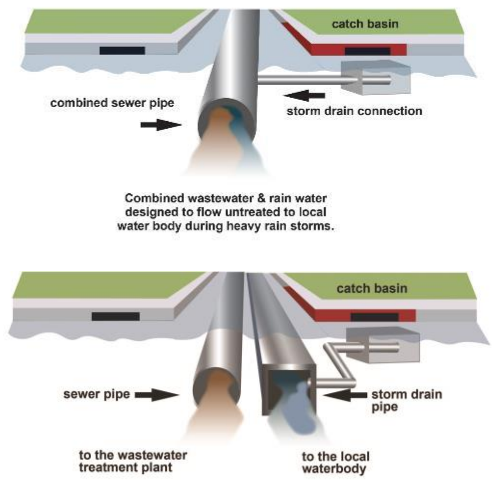
Integrated Overflow Control Plan

Wastewater System

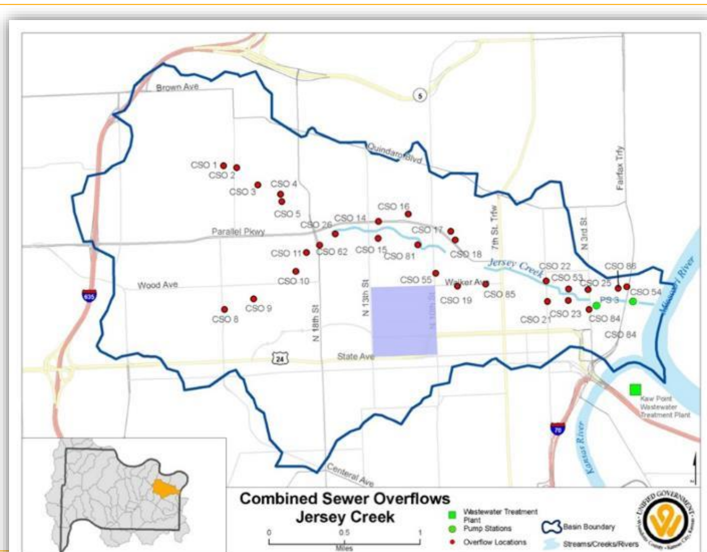
- 158 square miles
- 150,000 area residents
- 5 wastewater treatment plants
- 800 miles of sewers
- 115 employees
- 83 wastewater pump stations & 9 flood pump stations

Unified Government's Sewer System

- 1/3rd Combined Sewer System
- 2/3rd Separate Sewer System



Strugglers Hill – Combined Sewer System



Overflows Are the Issue

- Overflows are releases of diluted sewage into the environment
  - Bacteria
  - Litter
  - Debris

Integrated Overflow Control Plan

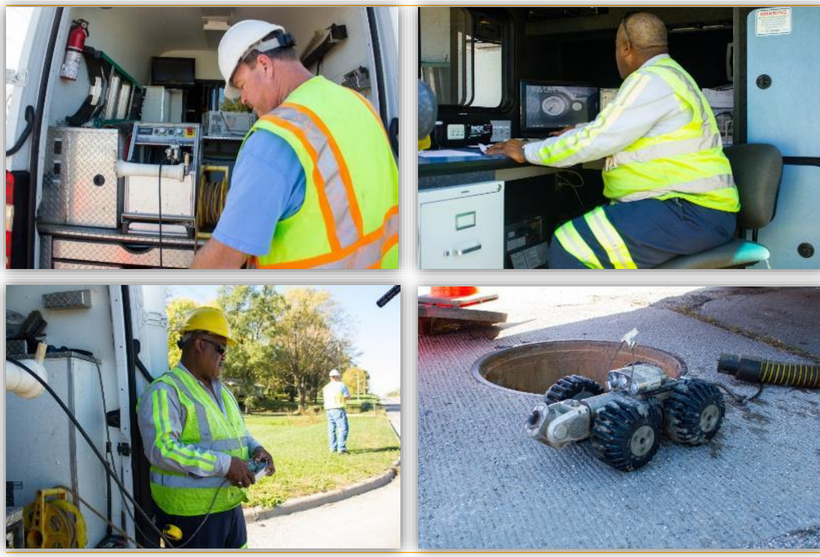
- What is the Unified Government doing to address overflows and protect water quality?
  - Continued Maintenance
  - Planning Studies
  - Revised Plan Due Sept 2016
  - Soliciting Input

Work Underway

- Pipe Maintenance
- Field Investigations
- Rainwater/Groundwater Reduction
- Sewer Pipe Repairs
- Sewer Manhole Repairs
- Pump Station Improvements
- Treatment Plant Improvements

Maintain System

Closed Circuit TV to find problems



Smoke Testing to find problems

Manhole Rehabilitation

- Tighten up to keep water out

The Regulatory Landscape

- All our work is regulated by EPA and KDHE under the Clean Water Act
- Kansas City, like most major cities, is under EPA mandates to dramatically reduce overflows
- We are currently in a "Consent Decree" that mandates activities now and long into the future.

Funding

- Ratepayers are making a substantial reinvestment in our aging infrastructure to:
  - reduce overflows
  - create local jobs
  - enhance our community
  - protect water quality
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Questions?

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  - **Email:** iocp@wycokck.org
  - **Call:** (913) 573-5700

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

Integrated Overflow Control Plan
Strugglers Hill Presentation

February 12, 2015
4:00pm - 6:00pm

Kansas State School for the Blind
1100 State Avenue
Kansas City, Kansas 66102

Your Name	Address	Phone Number	Email Address
KEVIN SWEARENGIN	61 MARKET ST. KC.K	913-573-1365	KSWEARENGIN@WYCOKCK.ORG
Karl & Carole Newton	1236 Everett Ave. KCKS	913-342-1925	carolepnewton@att.net
Ethel Coleman	1200 Everett KCKS	913-281-4953	
IDA Louise Bland	1900 N 72nd - KCKS	913-602 6989	~~X~~
Edwynne Harrison	1215 Oakland ave - KCKS	913-281-3277	—
Clifford Liggins	1020 New Jersey	816-520-2753	ligginsclifford@yahoo.com
TRENTON FOGLESONG	50 market St, KC, KS 66118	913-573-1300	tfoglesong@wycokck.org
J [illegible]	[illegible]		
A Kump	KCKPD - CAPTAIN		AKump@KCKPD.org
Tom McMillan	KCK PD	(913) 573-6026	TMCMillan@KCKPD.ORG

Integrated Overflow Control Plan

February 17, 2015

Highlights

- Major upgrades will be coming to our sewer system
- We will preserve our system and continue protecting our rivers and lakes
- We appreciate your time and input

Integrated Overflow Control Plan

Wastewater System

- 158 square miles
- 150,000 area residents
- 5 wastewater treatment plants
- 800 miles of sewers
- 115 employees
- 83 wastewater pump stations & 9 flood pump stations

Unified Government's Sewer System

- 1/3rd Combined Sewer System
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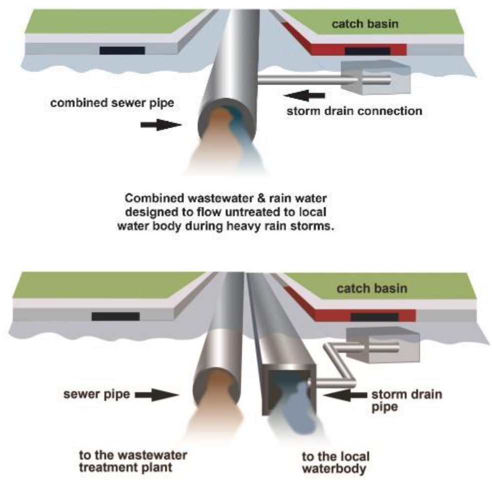

Overflows Are the Issue

- Overflows are releases of diluted sewage into the environment
  - Bacteria
  - Litter
  - Debris

Integrated Overflow Control Plan

- What is the Unified Government doing to address overflows and protect water quality?
  - Continued Maintenance
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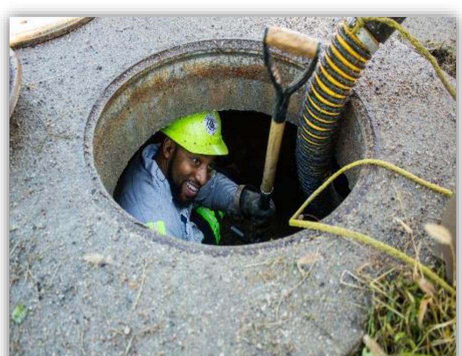
  - Revised Plan Due Sept 2016
  - Soliciting Input

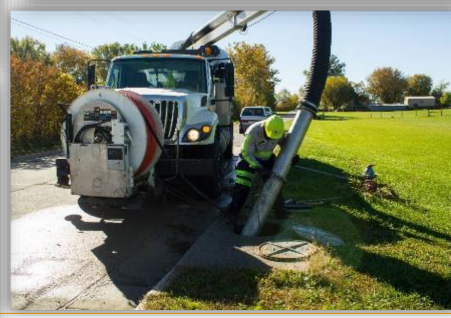
Work Underway

- Pipe Maintenance
- Field Investigations
- Rainwater/Groundwater Reduction
- Sewer Pipe Repairs
- Sewer Manhole Repairs
- Pump Station Improvements
- Treatment Plant Improvements

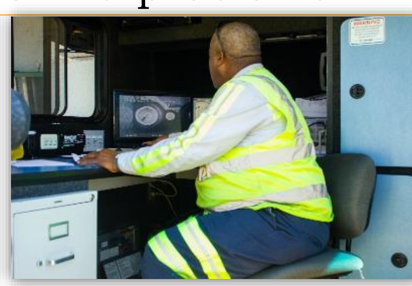


Maintain System



Closed Circuit TV to find problems

Smoke Testing to find problems

Manhole Rehabilitation

- Tighten up to keep water out

The Regulatory Landscape

- All our work is regulated by EPA and KDHE under the Clean Water Act
- Kansas City, like most major cities, is under EPA mandates to dramatically reduce overflows
- We are currently in a "Consent Decree" that mandates activities now and long into the future.

Funding

- Ratepayers are making a substantial reinvestment in our aging infrastructure to:
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  - create local jobs
  - enhance our community
  - protect water quality
- Much work is left to be done and the longer it is delayed, the greater the need and cost becomes.
- Financial Capacity will be considered when negotiating with the EPA

Questions?

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  - **Visit:** www.wycokck.org/pw
  - **Email:** iocp@wycokck.org
  - **Call:** (913) 573-5700

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas •

Integrated Overflow Control Plan
Wyandotte Countians Against Crime

February 17, 2015
7:00pm - 8:30pm

Dynamic Life Baptist Ministries
1916 Central Avenue
Kansas City, Kansas 66102

Your Name	Address	Phone Number	Email Address
Paul R. Soptick	655 24th St. KCK	(913) 281-4351	pprsjr@aol.com
Kathryn Zunick	637 Orville Ave. KCK	~~(913~~	
Duke & JoAnn Nelson	24 N. 14th KCK		
Dave Atwell	715 S. 78th KCK	(913) 299-3283	
Joe Dercher	258 S. Coy St. KCK	(913) 371-3282	
Bob Laubsch	908 Lyon Ave. KCK	(913) 485-0865	
Gerry & Chris Sophet			
Teresa Planes			
Ernie Davidson			
Michael Aguilar	49 N. Thorpe St. KCK 66102	(913) 626-9252 (?)	michaelaguilar-7@aol.com
Dean Zogortz	361 City Park Dr. KCK		
Holli Joyce	361 City Park Dr. KCK		

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

Integrated Overflow Control Plan
Wyandotte Countians Against Crime

February 17, 2015
7:00pm - 8:30pm

Dynamic Life Baptist Ministries
1916 Central Avenue
Kansas City, Kansas 66102

Your Name	Address	Phone Number	Email Address
Joy Wardlow	214 N. 13th St. KCK		
Phyllis Kopp	1916 Central KCK		
John Bincket	Copps	(913) 573-8730	
Patty Sowe	339 N. 33rd St. KCK	(913) 621-1029	
Sonya Martinez	3833 Ruby Ave. KCK	(816) 789-4476	
Marcus Robinson	5023 Maple St.	(913) 832-9179	

Integrated Overflow Control Plan

February 22, 2015

Highlights

- We will preserve our system and continue protecting our rivers and lakes
- Major upgrades will be coming to our sewer system
- We appreciate your time and input

Tue 1/27/2015 11:01 AM

Generaux, Andrea <ageneraux@wycokck.org>

RE: Copy of sign-in sheet

To Erin Dougherty

You replied to this message on 1/27/2015 11:01 AM.

There were 56 listed on our sign –in sheet but all 65 of our chairs were full so I think we missed a few.

Martha Smith- does not have email
Scott Murray – scottmurray2020@yahoo.com
Donnie Thomas – donniegale11@yahoo.com
Paul Soptick – pprsjr@aol.com
Barb Kill – bkill@kc.rr.com
Teresa Clardy – teresac@workforcepartnership.com

Integrated Overflow Control Plan

February 24, 2015

Highlights

- We will preserve our system and continue protecting our rivers and lakes
- Major upgrades will be coming to our sewer system
- We appreciate your time and input

The Regulatory Landscape

- All our work is regulated by EPA and KDHE under the Clean Water Act
- Kansas City, like most major cities, is required to dramatically reduce overflows
- We are currently preparing a plan to meet regulatory requirements now and long into the future.

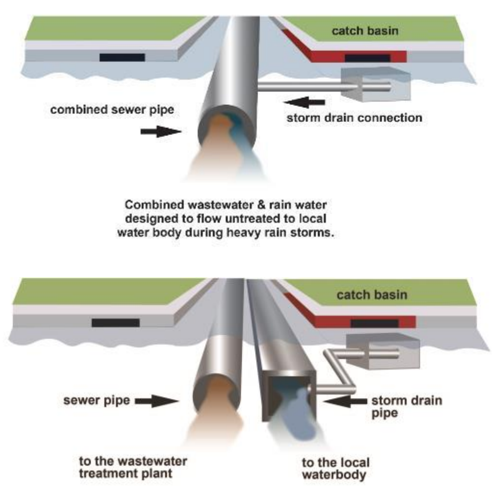
Integrated Overflow Control Plan

Wastewater System

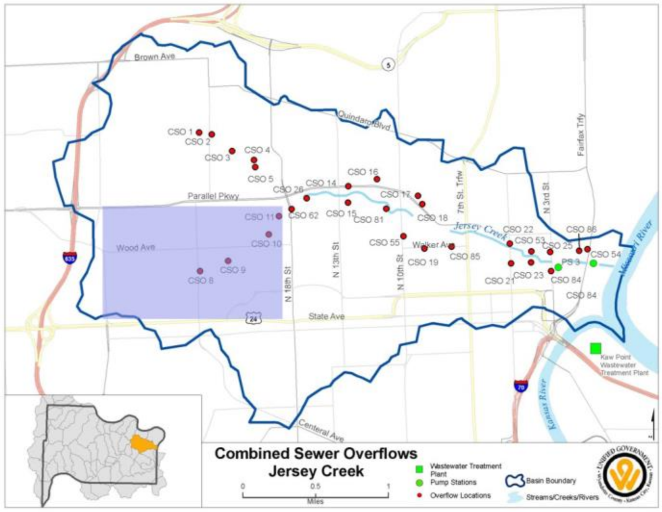
- 158 square miles
- 150,000 area residents
- 5 wastewater treatment plants
- 800 miles of sewers
- 115 employees
- 83 wastewater pump stations & 9 flood pump stations

Unified Government's Sewer System

- 1/3rd Combined Sewer System
- 2/3rd Separate Sewer System



Kensington – Combined Sewer System



Overflows Are the Issue

- Overflows are releases of diluted sewage into the environment
  - Bacteria
  - Litter
  - Debris

Integrated Overflow Control Plan

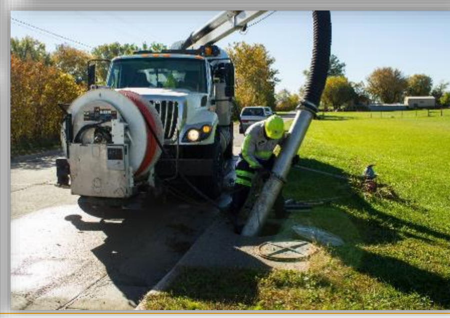
- What is the Unified Government doing to address overflows and protect water quality?
  - Continued Maintenance
  - Planning Studies
  - Revised Plan Due Sept 2016
  - Soliciting Input

Work Underway

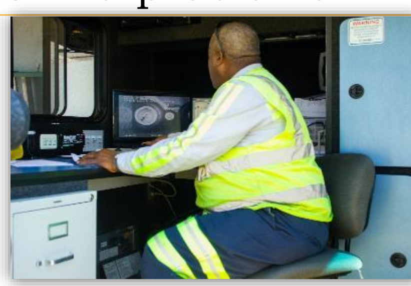
- Pipe Maintenance
- Field Investigations
- Rainwater/Groundwater Reduction
- Sewer Pipe Repairs
- Sewer Manhole Repairs
- Pump Station Improvements
- Treatment Plant Improvements

Maintain System



Closed Circuit TV to find problems

Smoke Testing to find problems

Manhole Rehabilitation

- Tighten up to keep water out

Funding

- Ratepayers are making a substantial reinvestment in our aging infrastructure to:
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Questions?

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  - **Email:** iocp@wycokck.org
  - **Call:** (913) 573-5700

KENSINGTON COMMUNITY AREA
WATCH- NEIGHBORHOOD MEETING

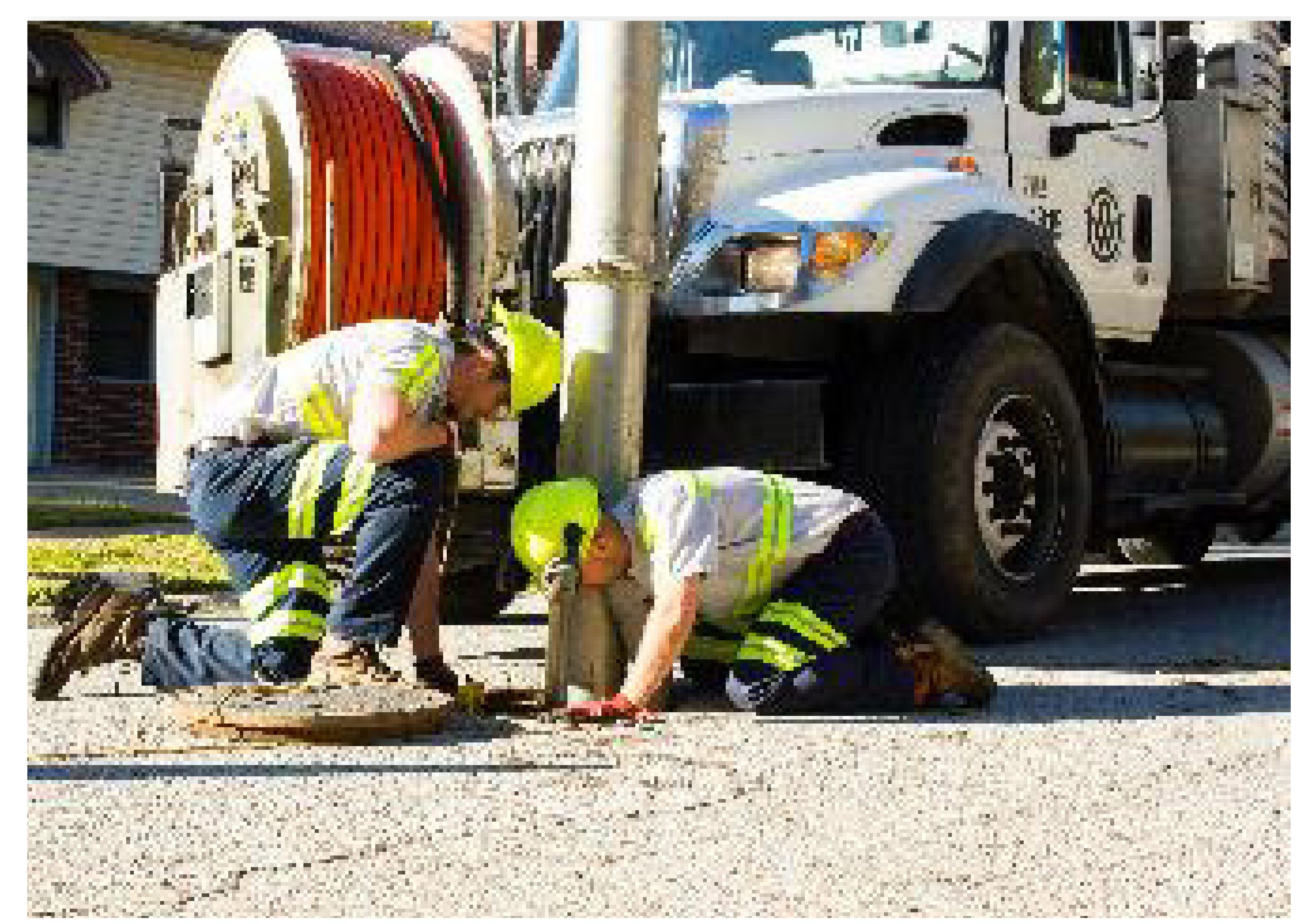
DATE: Feb. 24, 2015

NAME	ADDRESS	PHONE	KCA W
Donnie Thomas	1726 N. 32nd St. KC, KS	913 708-1833	
Erin Dougherty	Shockey Consulting Services	760 802-2411	
Hazel Matlock	1418 N. 32 St KCK	913-620-3748	
Clarence Matlock	1546 N 33 St KCKS	913-621-6658	
Lillian Hobbs Moore	1851 Tennyson KCK	913-371-4844	
Elaine Ward	1835 North 27	913-342-2164	
Bill Heatherman	U.G.	913-573-5416	
P. Brunner	1729 N. 30th KCK	913-342-0628	
Waldo Margheim	Burns & McDonnell	816-844-4641	
Patrick Holton	4953 State Ave	(913) 573-8609	
Harold Johnson	3043 State Ave	913 244 7973	
Elvira Coffee	1931 N. 28th st.	281-5216	
Patrick Robino			
Lorene Wilson	1926 N. 25th St	281-1560	
Lula Reddick	1847 N 28	371-0704	
Don McClain	3712 Wood	621-6098	
Marie Broadnax	2600 N 38th St	342-1807	

Integrated Overflow Control Plan

What is the Unified Government doing to address overflows and protect water quality?

- Continued Maintenance
- Planning Studies
- Revised Plan Due Sept 2016
- Soliciting Input



The Regulatory Landscape

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- We are currently preparing a plan to meet regulatory requirements now and long into the future.

Integrated Overflow Control Plan

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- 5 wastewater treatment plants
- 800 miles of sewers
- 115 employees
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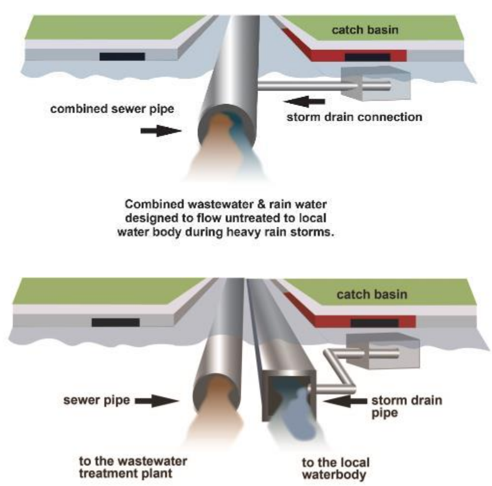

Overflows Are the Issue

- Overflows are releases of diluted sewage into the environment
  - Bacteria
  - Litter
  - Debris

Integrated Overflow Control Plan

- What is the Unified Government doing to address overflows and protect water quality?
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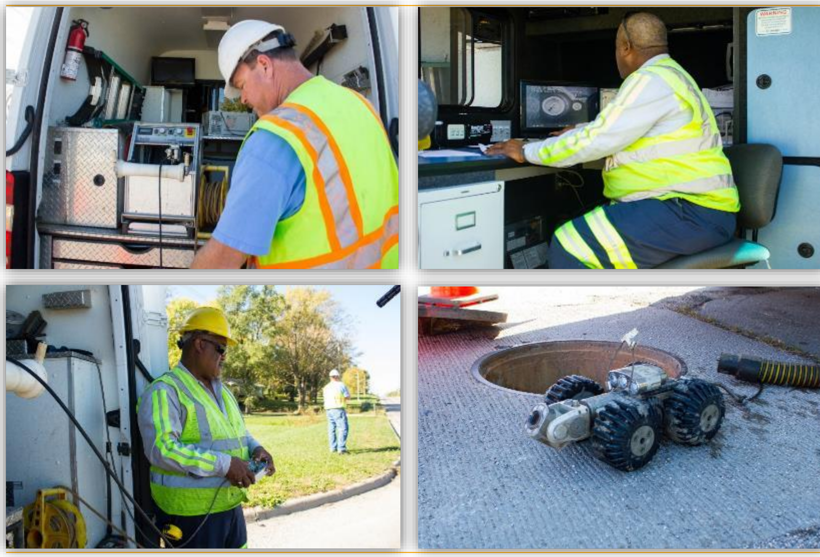
Work Underway

- Pipe Maintenance
- Field Investigations
- Rainwater/Groundwater Reduction
- Sewer Pipe Repairs
- Sewer Manhole Repairs
- Pump Station Improvements
- Treatment Plant Improvements

Maintain System

Closed Circuit TV to find problems



Smoke Testing to find problems

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Integrated Overflow Control Plan

April 20, 2015

Highlights

- We will preserve our system and continue protecting our rivers and lakes
- Major upgrades will be coming to our sewer system
- We appreciate your time and input

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Integrated Overflow Control Plan

Wastewater System

- 158 square miles
- 40,000 residential accounts
- 3,500 commercial/industrial accounts
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- 800 miles of sewers
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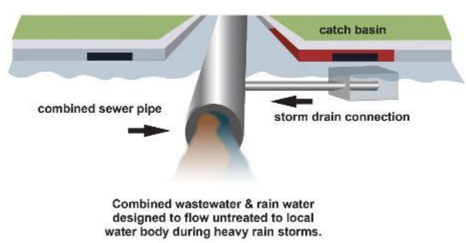
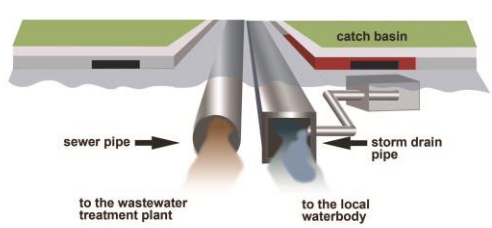
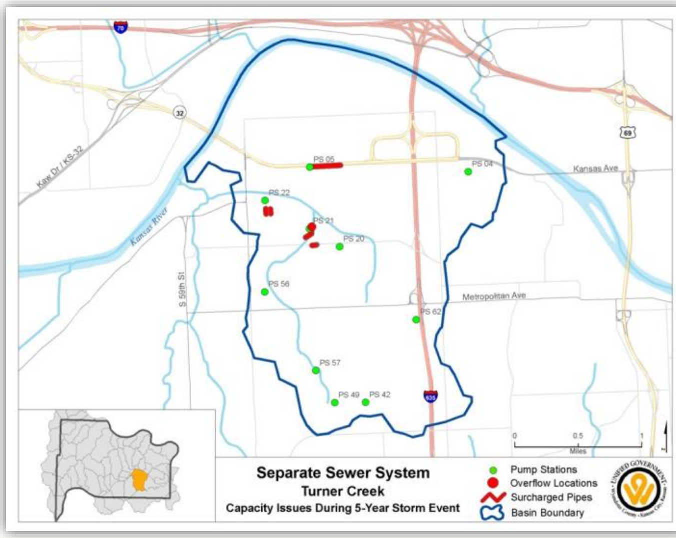




Turner Community – Separate Sewer System

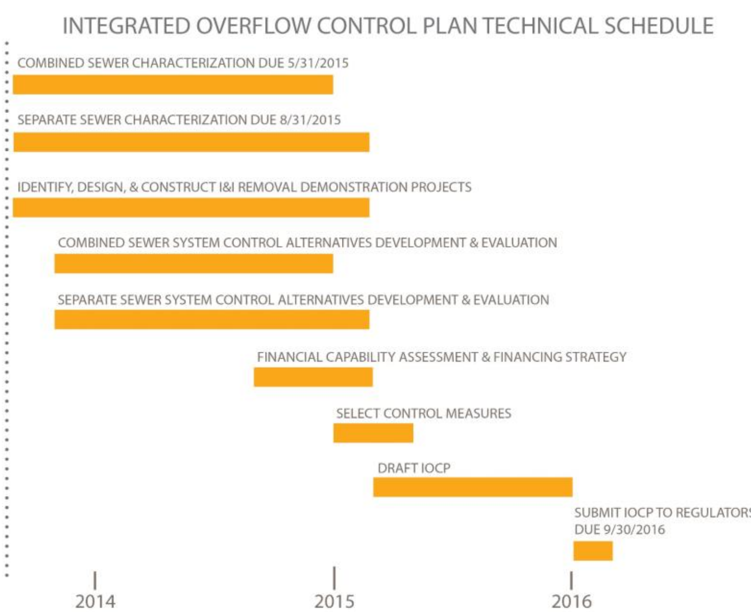


Overflows Are the Issue

- Overflows are releases of untreated, diluted sewage into the environment
  - Bacteria
  - Litter
  - Debris

Integrated Overflow Control Plan

- What is the Unified Government doing to address overflows and protect water quality?
  - Continued Maintenance
  - Planning Studies
  - Revised Plan Due Sept 2016
  - Soliciting Input



Work Underway

- Pipe Maintenance
- Field Investigations
- Rainwater/Groundwater Reduction
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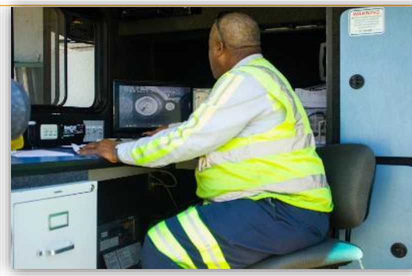
Maintain System

Closed Circuit TV to find problems

Smoke Testing to find problems



Manhole Rehabilitation

- Tighten up to keep water out

Funding

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UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

Integrated Overflow Control
Turner Community Connection Presentation

April 20, 2015
6:30pm - 7:30pm

First Baptist Church of Turner
701 South 55th Street
Kansas City, Kansas

Your Name	Address	Phone Number	Email Address
Bob Blackmore	5606 Pawnee Dr.	913-287-6600	rblackmorek@aol.com
Barb Kill	5548 Pawnee Dr	913 287 8863	bkill@kc.rr.com
Becky Billigmeier	2540 S 59th st	913 375 1325	billigmeierb@gmail.com
Kendall McReynolds	1303 S. 53rd ST	913-725-0127	mcreynolds194@msn.com
Jerry Gensler	5347 Clark	913-287-9586	mjworkout24@yahoo.com
Mary Gensler	5347 Clark	913-287-9586	" " "
Melissa Bynum	3756 N. 83 66109	913-281-8908	melissab@sckck.org
Floyd Gibson	1140 S. 48th Terrace	913-287-8292	bgibson1937@live.com
Betty Gibson	1140 S. 48th Terrace	913-287-8292	" "
Sharon Hoover	1043 S 55th st KCK	913-596-1143	sharon hooverkck@gmail.com ~~Shooverkck~~
Calvin Hoover	" " "	" " "	chooverkck@gmail.com
Mike Pettey	918 S 53 Terr	913 287 7657	

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

Integrated Overflow Control
Turner Community Connection Presentation

April 20, 2015
6:30pm - 7:30pm

First Baptist Church of Turner
701 South 55th Street
Kansas City, Kansas

Your Name	Address	Phone Number	Email Address
Jim Jarsulic	1658 S. 55th	913-980-3183	tjarsulic@gmail.com
Steve Watson	5535 Pawnee Ave	917 287 8782	
Donna Lovett	1014 So. 56th Terr.	913-287-8114	
ZELLA ALTMAN	5610 EDGEHILL DR	913-735-9527	hummingbirdlighthouse @gmail.com
Robert Sharon	1124 S 48 ~~ter~~	913-375-6507	
[illegible] Robinson	1026 S 56	913-544-2208	
JAMES STEINHIBEL	1027 S 56	913 461 9769	
Dave Young	7235 Forest Dr. K.C.K.	913-375-1315	
DEBBIE TAYLOR	1141 S 48 ter KCK 66106	287 8121	dtaylor@hrblock.com
Bethany Kolman	919 S. 55th St KCK 66106	913-777-9794	techiegirlbk@gmail.com
Sue Reich	2420 S. 73rd St	"	"
KEVIN SWEARENGIN	50 MARKET ST.	913- ~~528~~ 573-1365	KSWEARENGIN@WYCOKCK.ORG

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

Integrated Overflow Control
Turner Community Connection Presentation

April 20, 2015
6:30pm - 7:30pm

First Baptist Church of Turner
701 South 55th Street
Kansas City, Kansas

Your Name	Address	Phone Number	Email Address
Kellim Tavar Betancourth	1325 S. 52nd St. KC KS 66106	(913) 982-7918	Ke.bato@yahoo.com
	*5235 Dixie Ct KCKS 66106		

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

Integrated Overflow Control
Turner Community Connection Presentation

April 20, 2015
6:30pm - 7:30pm

First Baptist Church of Turner
701 South 55th Street
Kansas City, Kansas

Your Name	Address	Phone Number	Email Address
Karen Greenwood	6047 Oak Grove Road	913-237-5462	kgforpeace@gmail.com

Integrated Overflow Control Plan

May 14, 2015

Highlights

- We will preserve our system and continue protecting our rivers and lakes
- Major upgrades will be coming to our sewer system
- We appreciate your time and input

The Regulatory Landscape

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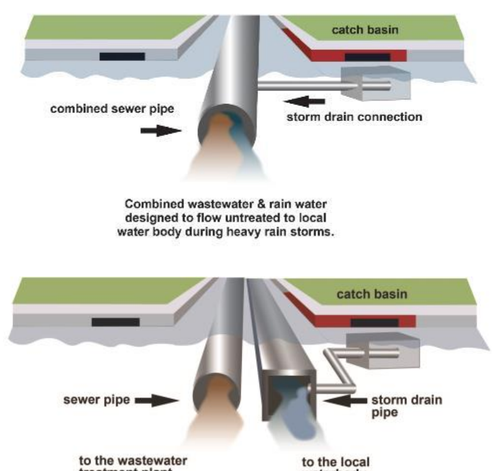
Integrated Overflow Control Plan

Wastewater System

- 158 square miles
- 40,000 residential accounts
- 3,500 commercial/industrial accounts
- 5 wastewater treatment plants
- 800 miles of sewers
- 115 employees
- 83 wastewater pump stations & 9 flood pump stations

Unified Government's Sewer System

- 1/3rd Combined Sewer System
- 2/3rd Separate Sewer System



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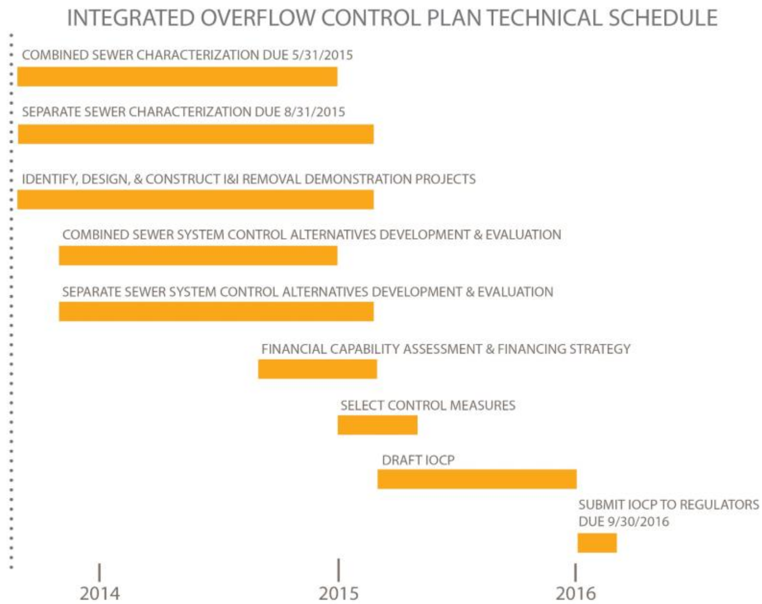

Work Underway

- Pipe Maintenance
- Field Investigations
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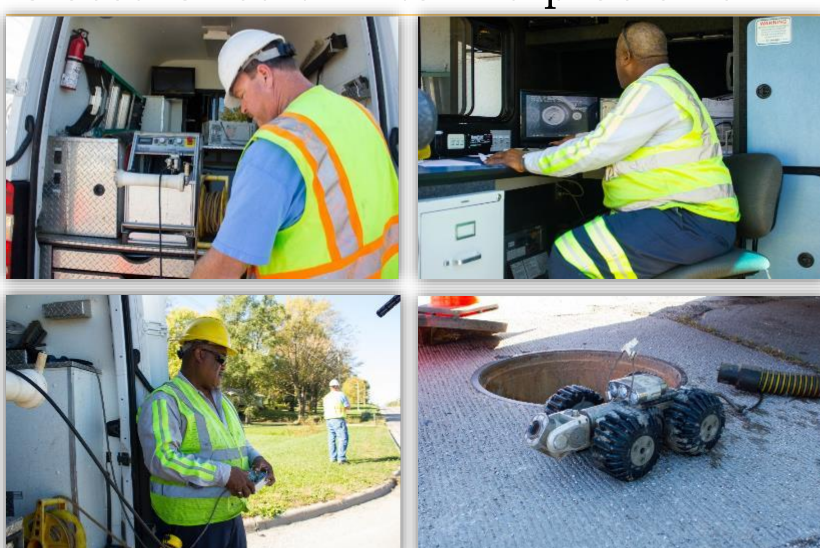
Maintain System

Closed Circuit TV to find problems



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- Tighten up to keep water out

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  - **Email:** iocp@wycokck.org
  - **Call:** (913) 573-5700

LEAVENWORTH ROAD ASSOCIATION
SIGN IN SHEET

DATE 7/14/15

NAME	ADDRESS	PHONE or EMAIL
Chris Linder		
Deb Wolfe		
Dewiese Davis		488-7711
Chris Linder		250-7424
Nathaniel Watson		299-3678
Mrs E Perkins		
Darrell Jochims		
Lou Bradwell		
Susan Rounes		
Rose Marie Allman		287-8192
Bill + Teri Murray		299-0121
John & Vicki Cameron		908-5659
IDA M. PRYOR		816-699-2450
Cheri Teters		816-519-9625
IRENE Breedlove		
Leonard Stallings		
TERRY Copperfield		
Dixie KASTER		
CARL KASTER		
Juanita Williams		913 334-0419
Lorena Mosser		
CAROLYN TAYLOR		
Gerald Yotter		388-7757
Linda Copeland		913-909-9445
James Tierney RCRPX.		
[illegible]		
Mark A Winner		(913) 638-6459
Mr Mc Rhonda Smith		
John Zwoack		
Donna Ready		
Hal Cummings		

Integrated Overflow Control Plan

May 19, 2015

Highlights

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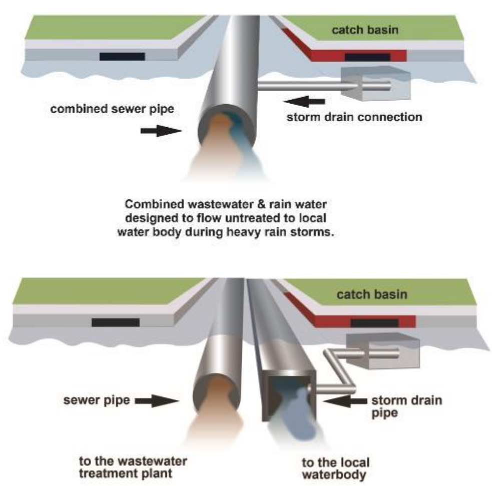
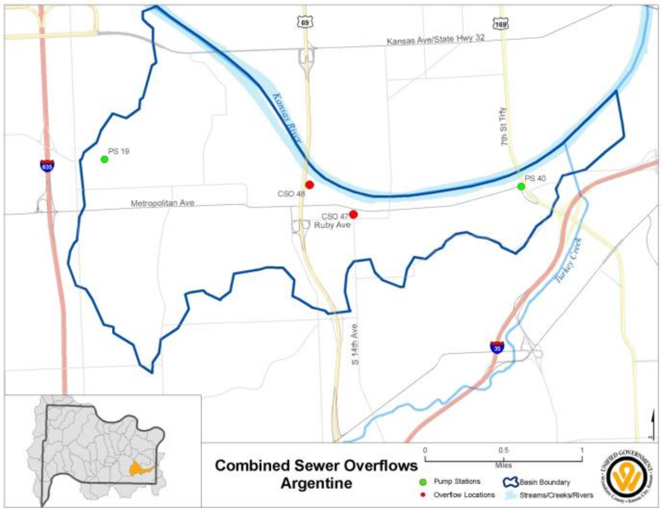


Argentine – Combined Sewer System



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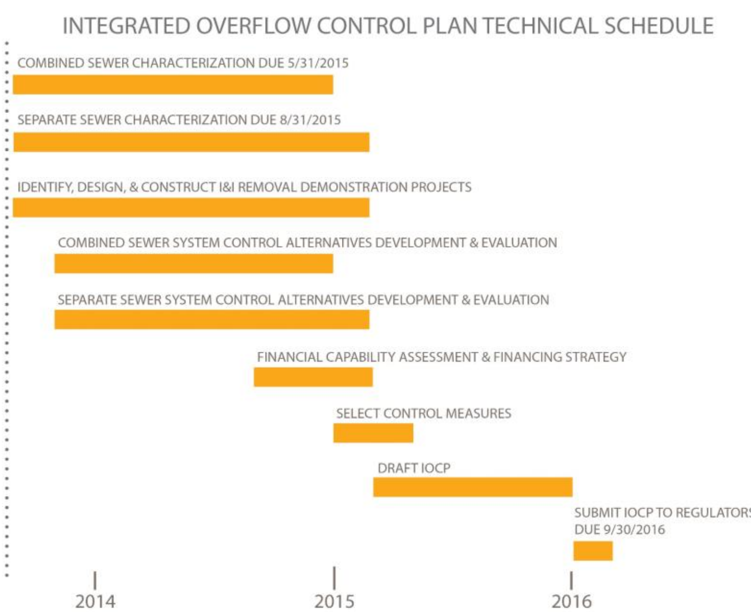

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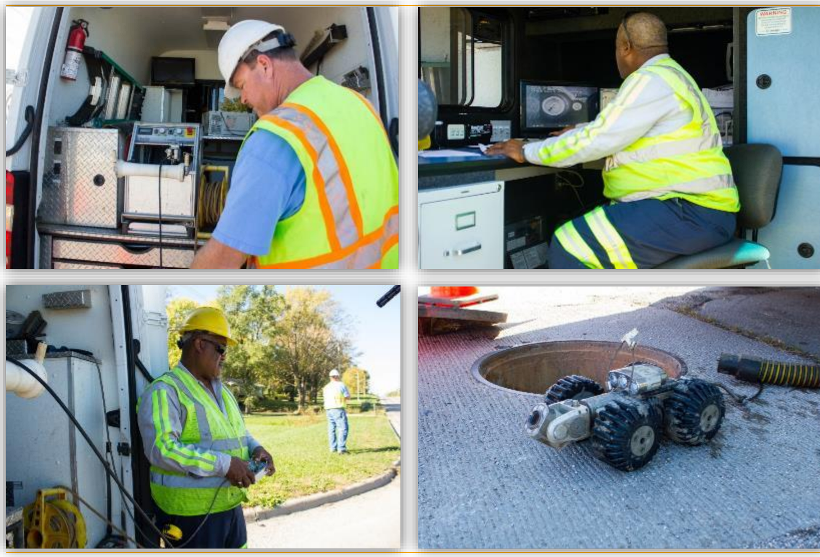

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UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas •

Integrated Overflow Control Plan
Argentine Neighborhood Development

May 19, 2015
6:00pm - 7:30pm

Argentine Library
2800 Metropolitan Ave
Kansas City, KS 66106

Your Name	Address	Phone Number	Email Address	Future Updates?
Patrick Dunn	1216 S 038 St	816 797-6146		
RJ SAMUELS	3729 Met.	913 562 8422	RJDOS@Hotmail	
Julia Magaña	1813 S. 24	913-831-2613		
Frank Magaña	"	"		
Loretta Escobar	1438 S. 25th St.	(913) 362-8957		
Mario Escobar	" "	"		

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

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JONAS CRUZ	1239 METROPOLITAN AV.	913-371-2447		SAME
Janey Humphries	1600 Ruby	913-321-7289	humphriesrandja@gmail.com	Sure
VIRGINIA CHILES	3627 DOVER	913 262 7221	VCHILES@KC.RR.COM	OK.
Sally Murguia	2500 Strong	913 432 2506	samurguia@gmail.com	OK
STEVEN & SHARON JACKSON	1127 S. 36th ST	913-831-7322	STEVENZANE.JACKSON@GMAIL.COM	OK
Ted + Shirley Bright	1318 S. 34 st	913 362 0193	NA	OK
Lupe Oropeza	1314 So 34th St	~~9~~ 722 1271	N	
Patricia Dunn	1216 S. 38th St.	645-0876	patty62753@yahoo.com	OK
Harvey & Linda Hood	1439 So 39	831 2985		
Delores Johnson	3901 ~~Strong~~ Strong	831-4316	———	?

Integrated Overflow Control Plan

May 20, 2015

Highlights

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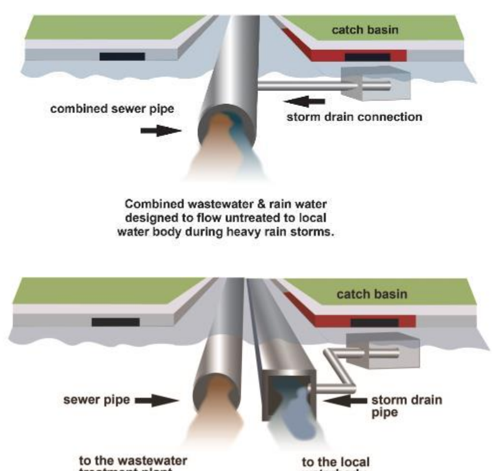
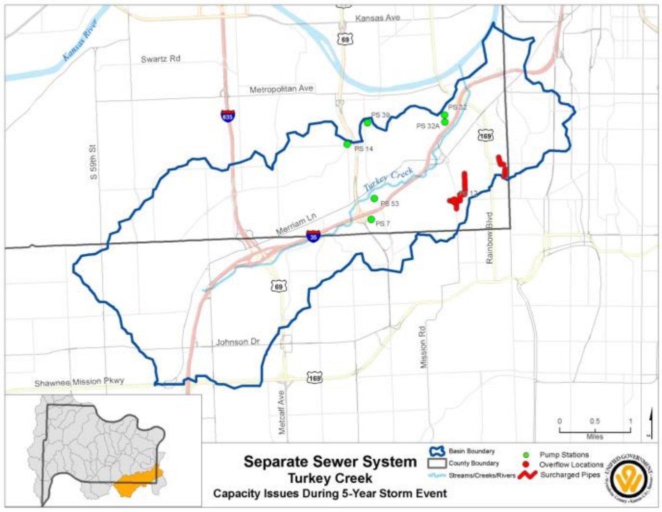


Rosedale Development Association
Separate Sewer System



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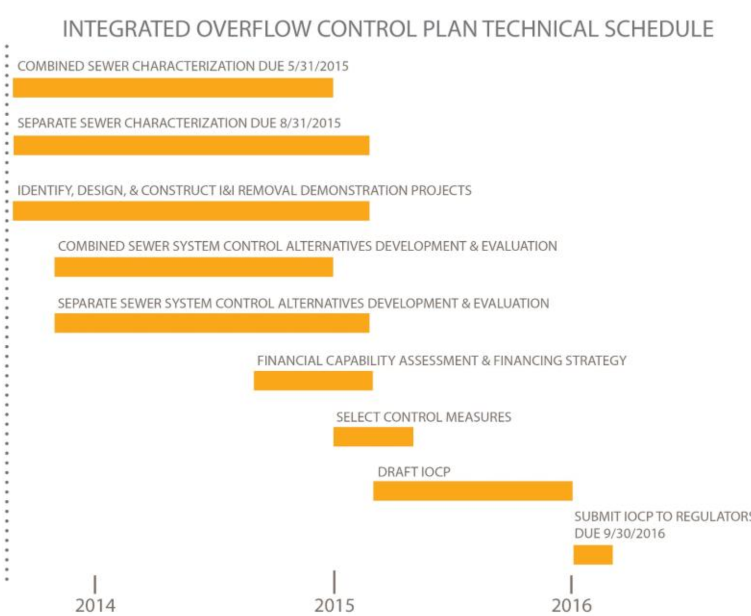

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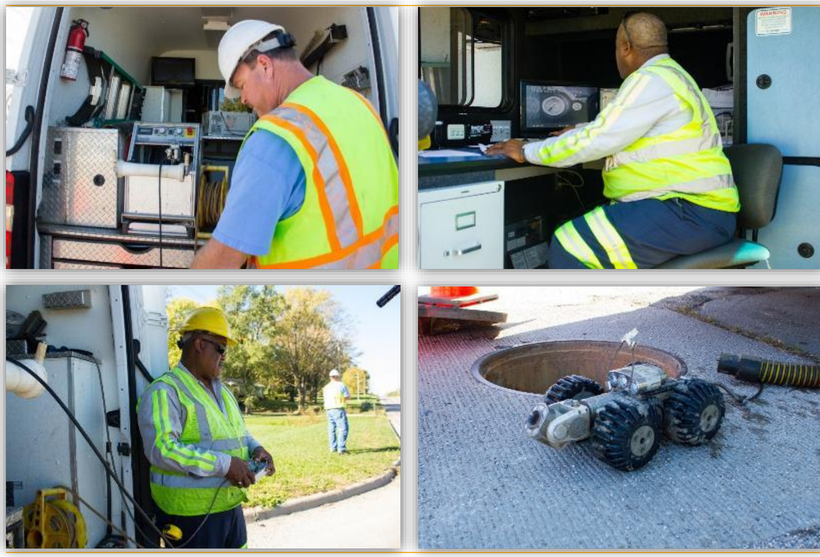

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UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

Integrated Overflow Control Plan
Rosedale Development Association

May 20, 2015
5:30 p.m. - 6:30 p.m.

1403 Southwest Blvd
Kansas City, KS 66103

Your Name	Address	Phone Number	Email Address	Future Updates?
Alexis G.	RDA	677.5097		
HAROLD HEPFER	4321 BOOTH	913-236-6356	HHEPFER@MSN.com	
Amanda Brinker	3875 Thompson St.	636-236-9126	amandabrinker@gmail.com	
JeT'aime Taylor	1403 Southwest Blvd	913.677.5097	info@rosedale.org	yes
Heidi Holliday	1403 SW Blvd	913-677-5097	heidi@rosedale.org	yes

Integrated Overflow Control Plan

May 21, 2015

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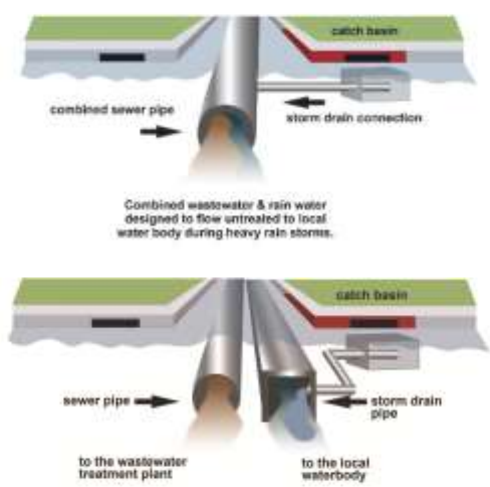
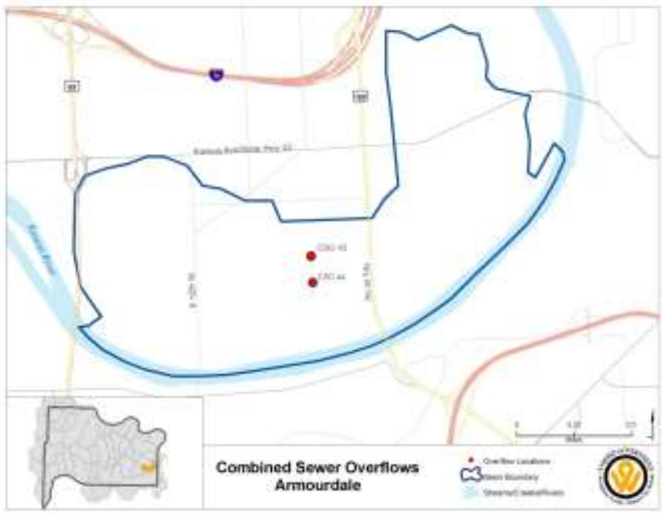


Armourdale Renewal Association
Combined Sewer System



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ARMOURDALE RENEWAL ASSOCIATION
COMMUNITY MEETING SIGN-IN SHEET
MAY 21, 2015

NAME	ADDRESS	PHONE NO.	E-MAIL ADDRESS
Carmen M. Oropeza	720 South Pyle KCK	(913) 281-5680	
[illegible]	812 So 9th St KCK	913-621-4647	
Mary E. King Kearns	1135 Holbrook Ave. KCKs	913 621 1934	
Fraida O'Dell	1301 Osage Ave KCK	342-8740	
Mary L Williams	828 Scott Ave KCKs	913-342-9412	
JC Alonzo	~~7th Park~~ 13000 W 87th 66215	913-248-9585	
Bill Heatherman	701 N 7th Street, KCKS 66101	913-573-5700	bheatherman@wycokck.org
Bill Hurrelbrink	701 N 7th St, KCKS 66101	913 573-5010	bhurrelbrink@wycokck.org
Linda Pendleton	2646 So. 18th, KCK 66106	913-208-6901	linda_pendleton@att.net
JEFF MISKEC	COMMUNITY POLICE	913 573 8751	JMISKEC@KCKPD.ORG

Integrated Overflow Control Plan

May 26, 2015

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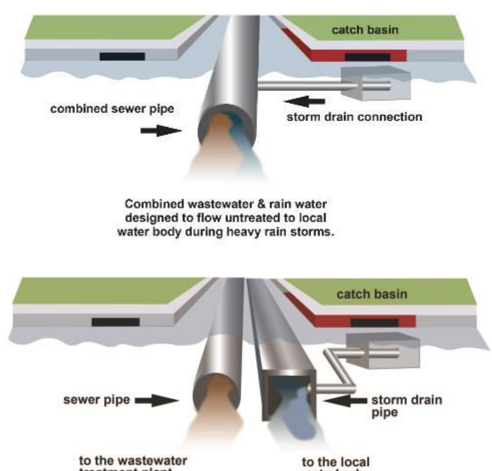
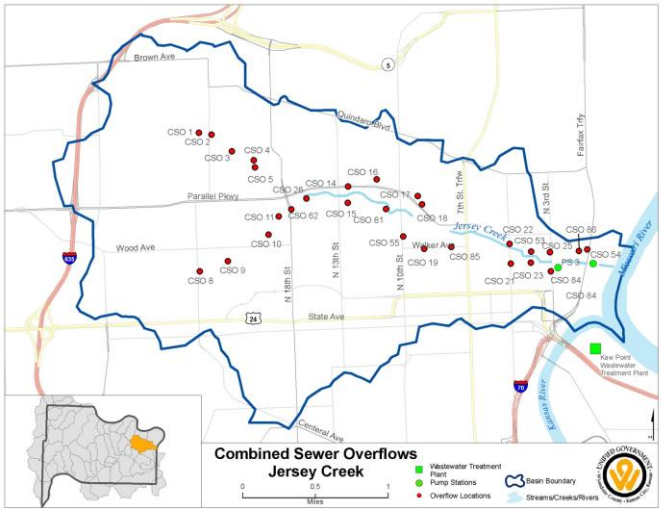


Downtown Shareholders of KCK Combined Sewer System



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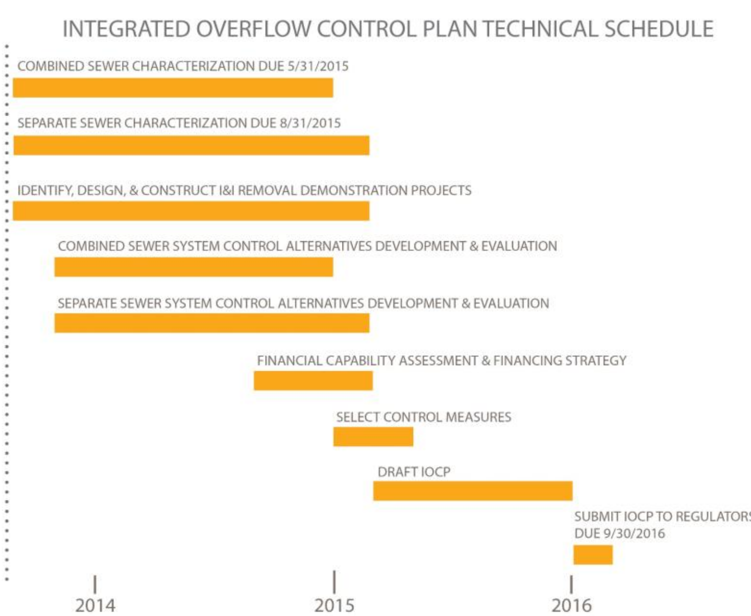

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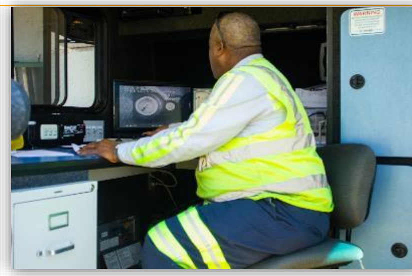

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Wed 5/27/2015 4:51 PM

Chuck Schlittler <director@downtownkck.org>

RE: Overflow Control Plan presentation

To Erin Dougherty

You replied to this message on 5/27/2015 4:54 PM.

Glad to have you folks w us Erin.

Attending were

Myself, Jody Farthing, Katy Schamberger, Teresa Matta, Clayton Hunter, Ashley Adorante, Sarah Antrobus, Kevin, Bill Heatherman, Brian Bunich, Bridgette Jobe, Jason Banks, Rob Richardson, Dorota Lopez, County Commissioner Melissa Bynum, Daniel Serda, Murray Rhodes, Wil Anderson, Bill Hutton

Chuck Schlittler, Director
Downtown Shareholders, KCK
Cell/Text: 913-387-6100
726 Armstrong, Ste 201
KC,KS, 66101
Office: 913-371-0705
Fax: 913-371-0705

Integrated Overflow Control Plan

May 28, 2015

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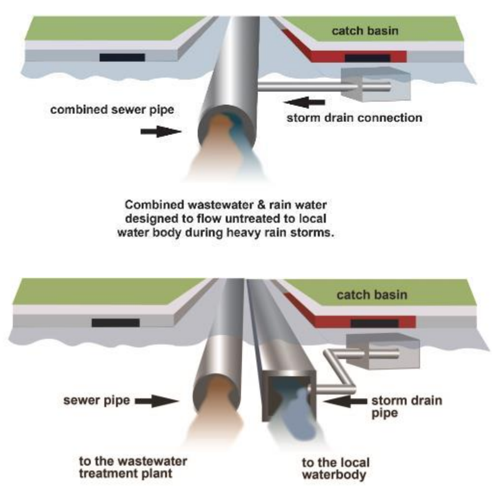
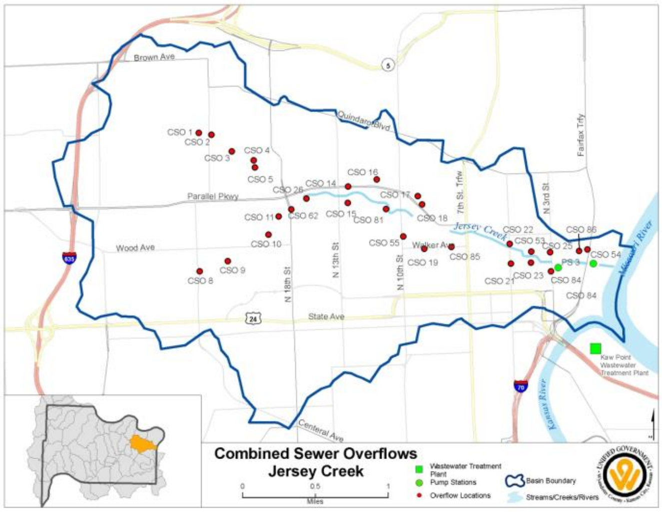


Historic Northeast Midtown Association Combined Sewer System



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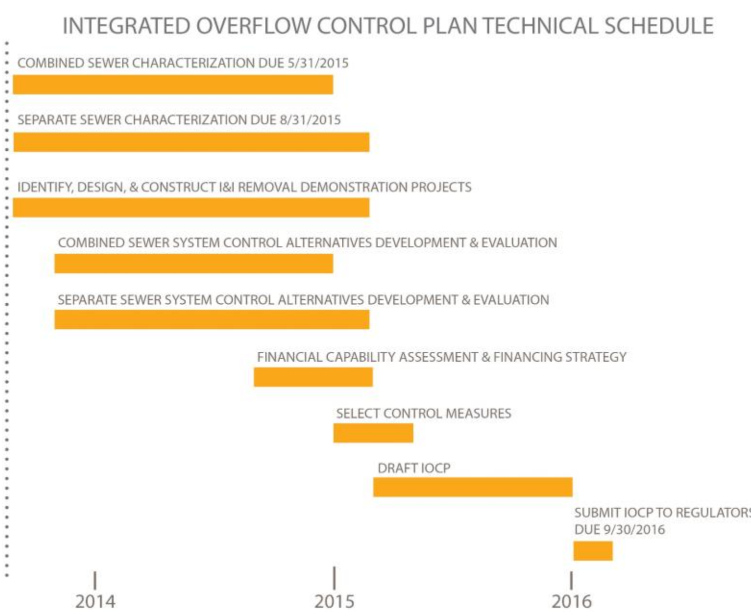

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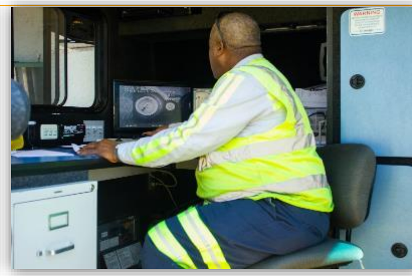

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2015 Monthly
[redacted] HNMA [redacted] Meeting-sign-In

HNMA

NAME	Organization/Business/Church	TELEPHONE NUMBER	MAILING ADDRESS	E-mail, www. Facebook, Twitter
JOE JENNINGS		913-307-6982	4600 SORTOR DR.	KCKS 66104
Dorothy Clark		(913) 371-4268	1312 Rowland ave.	KCK 66104
Lynnette Broker				
Christine Allen		913-575-6102	POB 1013 KCK 66104	

Integrated Overflow Control Plan

June 2, 2015

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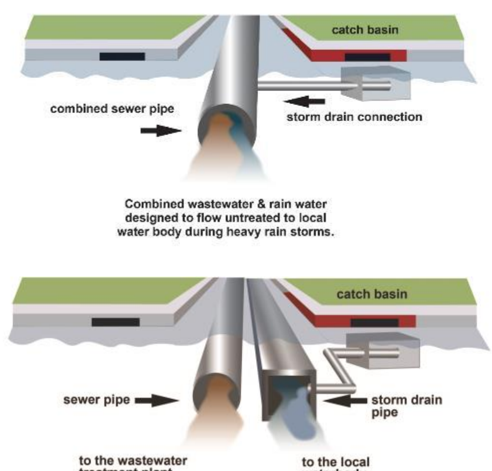
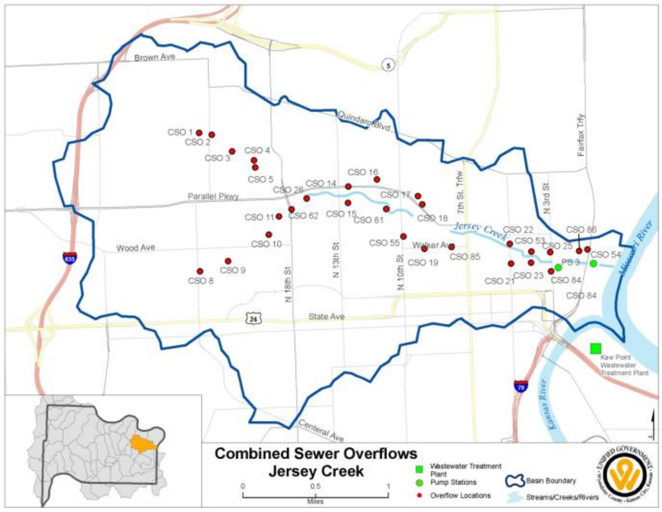


Jersey Creek
Combined Sewer System



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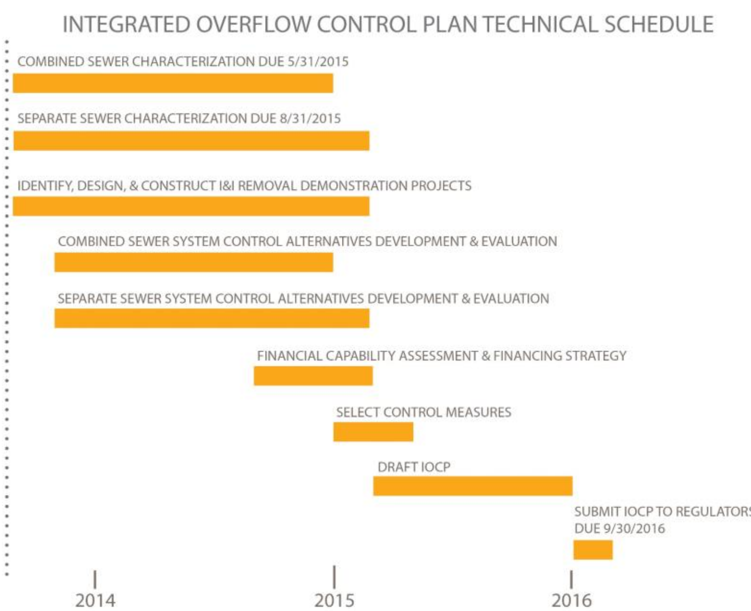

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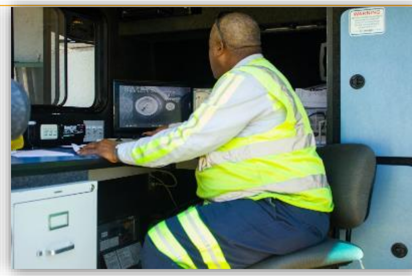
- Sewer Pipe Repairs
- Sewer Manhole Repairs
- Pump Station Improvements
- Treatment Plant Improvements

Maintain System

Closed Circuit TV to find problems

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Integrated Overflow Control Plan

June 9, 2015

Highlights

- We will preserve our system and continue protecting our rivers and lakes
- Major upgrades will be coming to our sewer system
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The Regulatory Landscape

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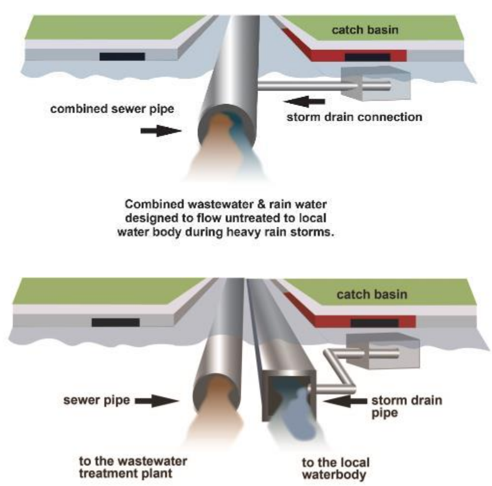
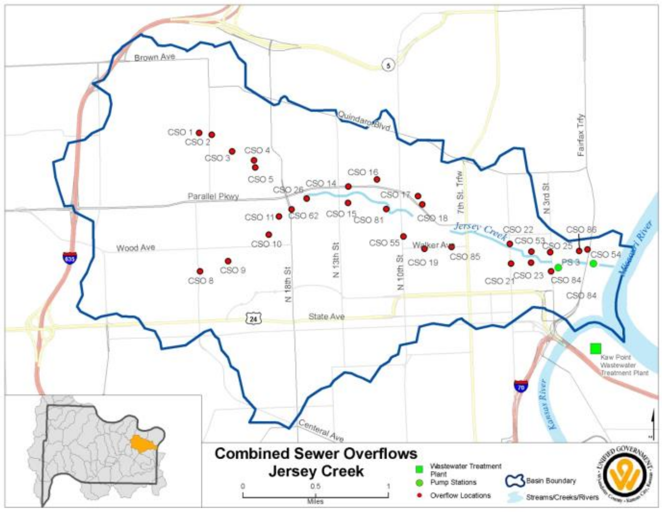


Jersey Creek
Combined Sewer System



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Integrated Overflow Control Plan

- What is the Unified Government doing to address overflows and protect water quality?
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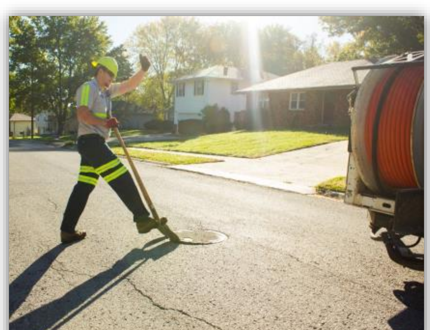

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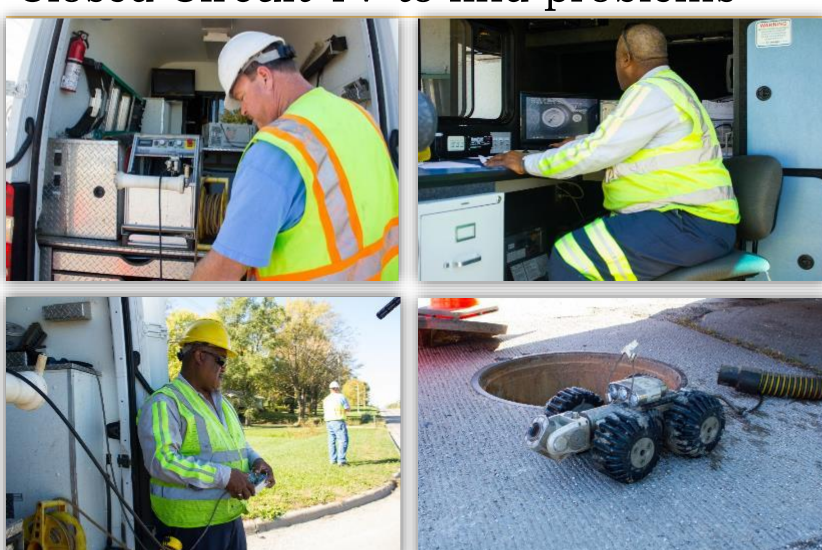

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UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

Integrated Overflow Control Plan
Historic Westheight Neighborhood Association

June 9, 2015
7:30 p.m. - 8:30 p.m.

St. Pauls Episcopal Church
1300 N. 18th Street
Kansas City, KS 66102

Your Name	Address	Phone Number	Email Address	Future Updates?
Waldo Marghem	9400 Ward Parkway KCMO	816-344-4641	wamarghem@bvmsncd.com	
Pam + Stan Jasinskas	2005 Washington Ave	913-621-2047	pjasinskas@kc.rr.com	yes
Phyllis Moore	3238 W Townsend Ct @ Leda's daughter	913-219-7149	moorephyllis4@gailmail	yes
Leola Bettis	1818 Oakland Ave	913-948-4369	no email address	please mail updates
Rick Yarnell	2424 Nebraska Ct	913-371-2648	ryarnell@wans.net	? Hmm.
Wyatt Breidenthal	1309 Hoel Parkway	913-927-0277	wyattbreid@hotmail.com	
Susan Allen	2001 Washington Ave.	913 371-3495	sallen64@kc.rr.com	
Russ Schweenmeyer	1220 Hoel Parkway	913-382-4406	rschweemeyer@kc.rr.com	yes
Corinna West	1921 Nebraska	816-392-6074	corinnawest816@gmail.com	yes
Jesus Casas	KCKPD	573 8708	jcasas@kckpd.org	
Rosalyn Berry	1109 Hoel Pkwy	913 636-7159	rosalynberry@hotmail.com	yes
Kelly Estis	1508 n 22nd		msKaci1e@hotmail.com	yes

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

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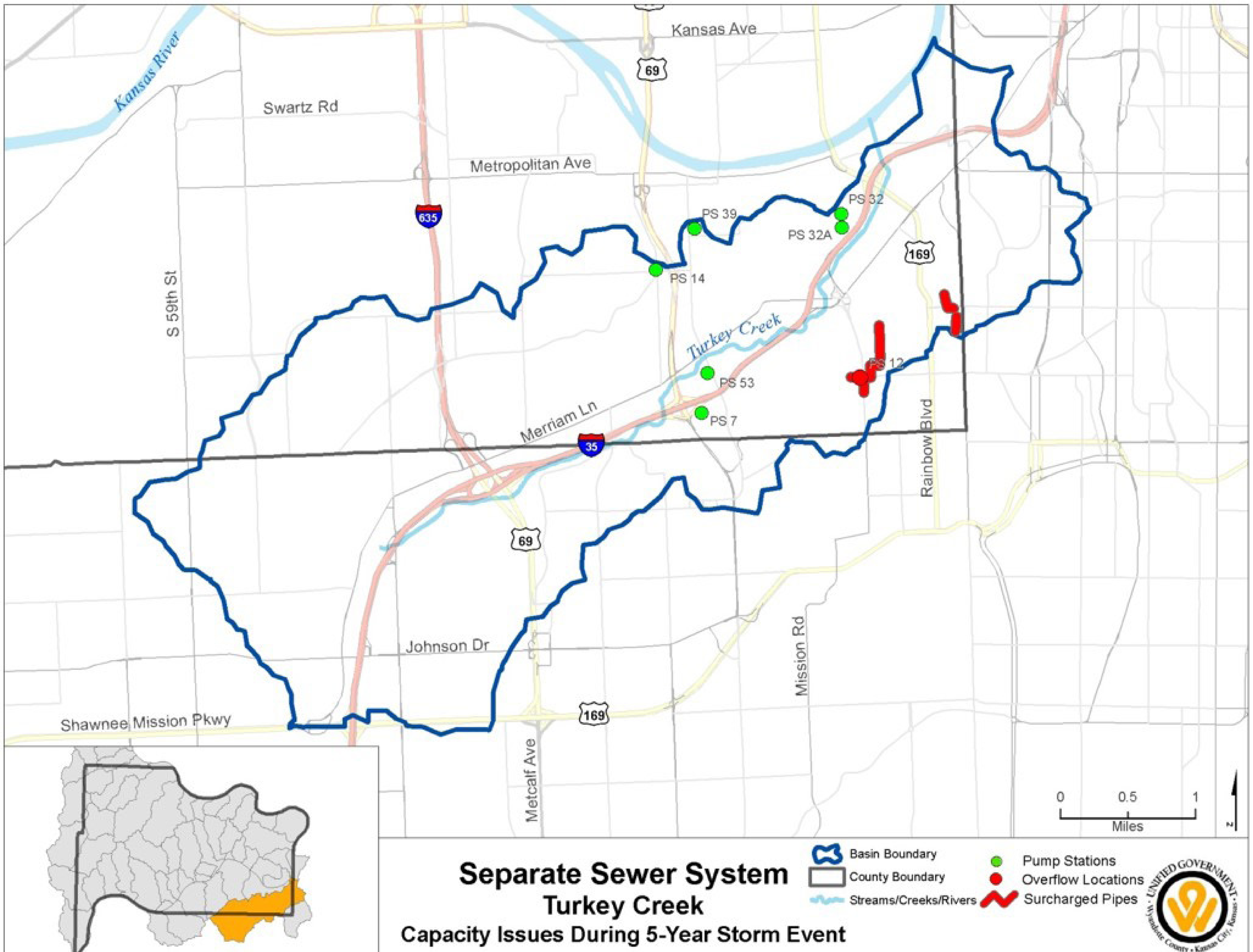
Mark Miller	1508 N 21st			
Ann Hill	1924 Nebraska	816-868-0541	ahill1924@gmail.com	
Marcy Smith	2001 WAshington Blvd	913 371-4895	MJT455@AOL	yes
Clayton Hunter	2225 Washington Blvd	816-590-9633	chunter56@msn.com	Yes

Turkey Creek

Separate Sewer System



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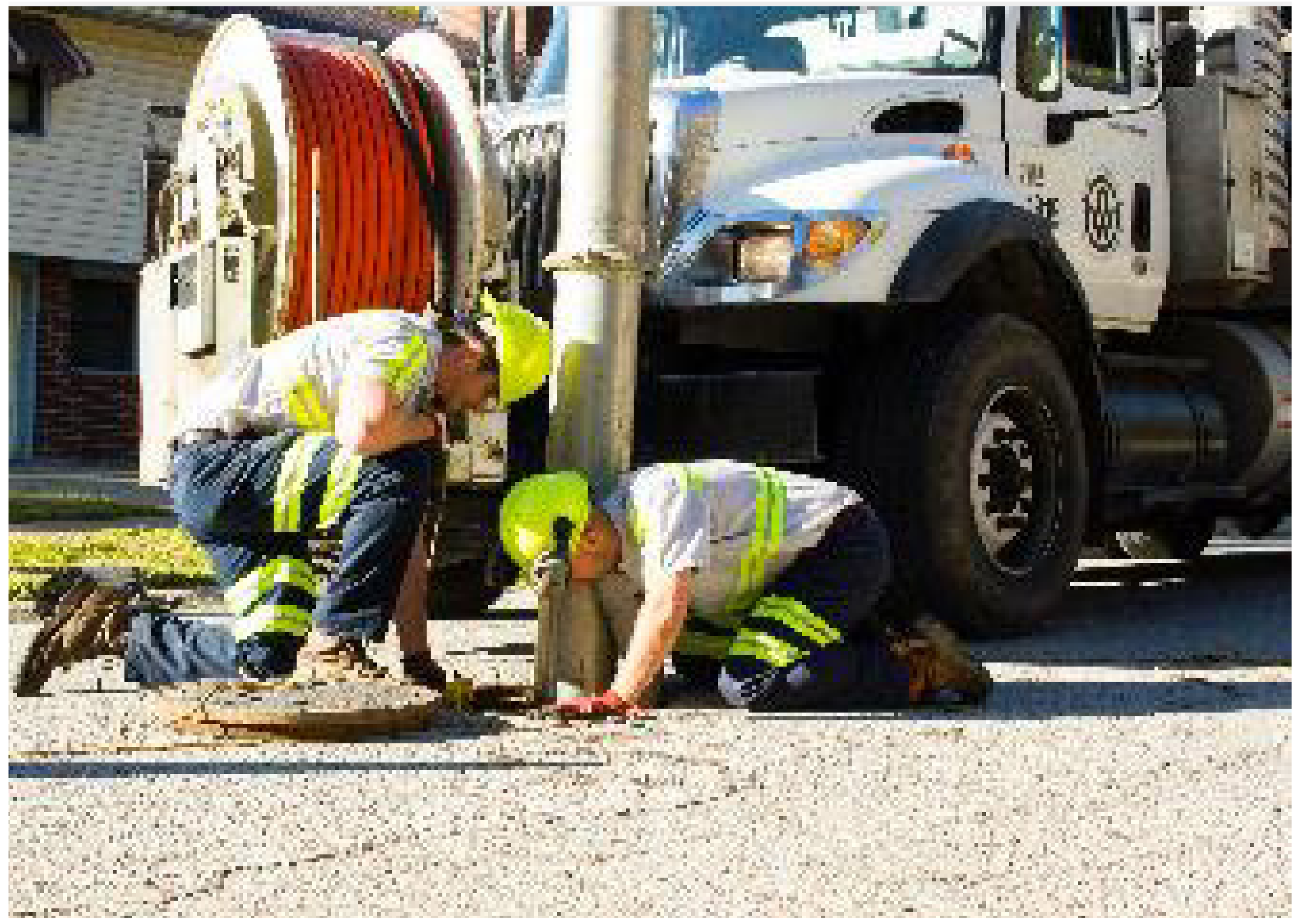

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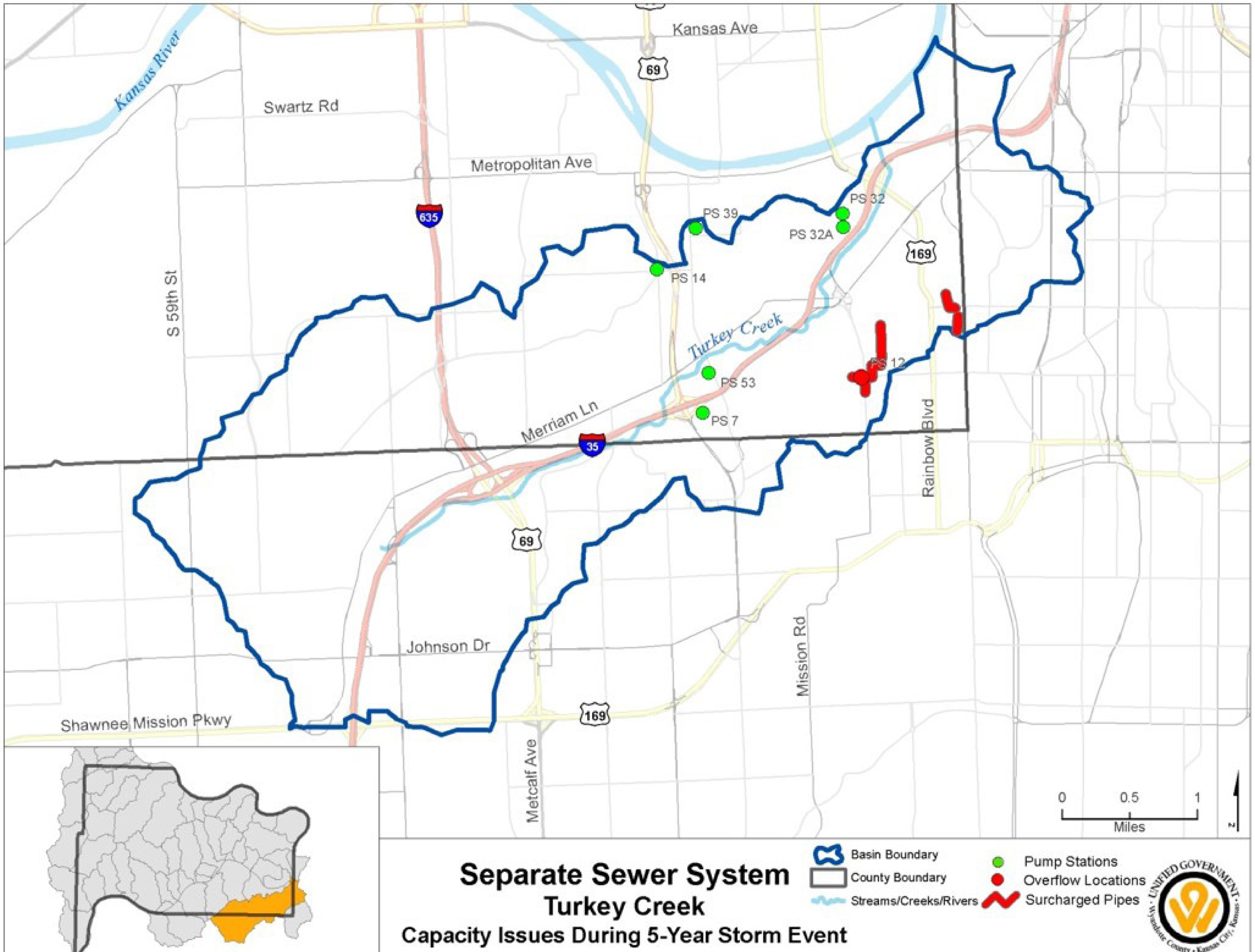

NAME	ADDRESS	PHONE	EMAIL
Nathan Schwantes	4501 Booth	913 638-6087	nathanschwantes@yahoo
HERB TEANEY	2918 W 43 Terr		
JOE POKALUK JR	4325 MISSION RD	236-6146	
Robin Parra	2608 W. 45th Ave 66103	816 591 2190	rparra1956@Gmail.com
Robert Parra	" " "	913 244-3794	—
Callie Grantham	2614 W 44th ave	816 716 3556	calliejg@sbcglobal.net
Annette Rude	4421 Springfield	9136206273	annetterude @sbcglobal. net
Ahnna Nanoski	1403 SW BLVD	913.677.5097	ahnna@rosedale.org
Bill Heatherman	4540 ADAMS KC KS 66103	913.573.5416	billheatherman @hotmail .com
Reggie –	2614 W 44th ave –	816-337-7160	
Zach Flanders	4415 Booth St	785 331 8149	zachflanders@gmail.com
VALLEJO, DENISE	4951 STATE AVE	973-8726	dvallejo@kckpd.org

Integrated Overflow Control Plan

July 14, 2015

Highlights

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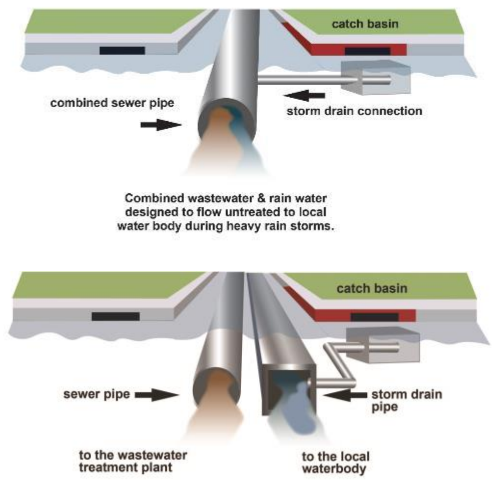

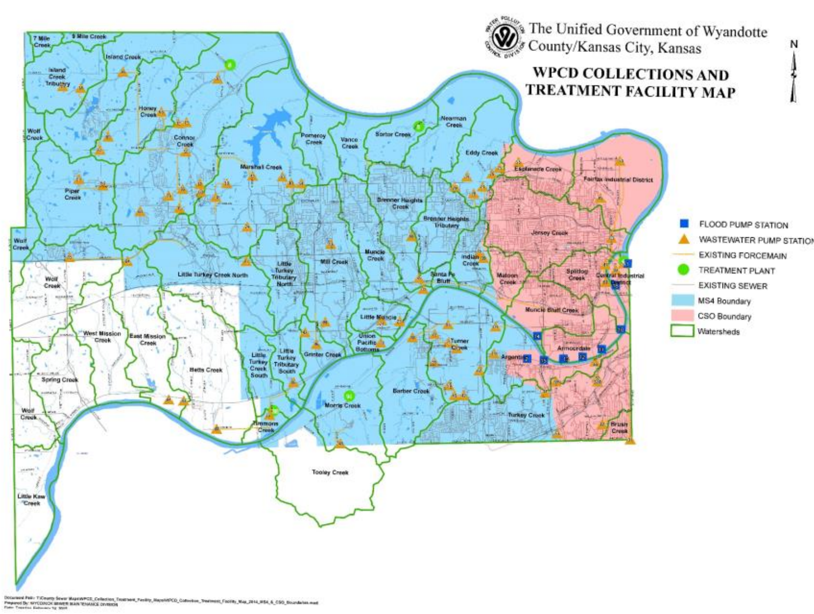

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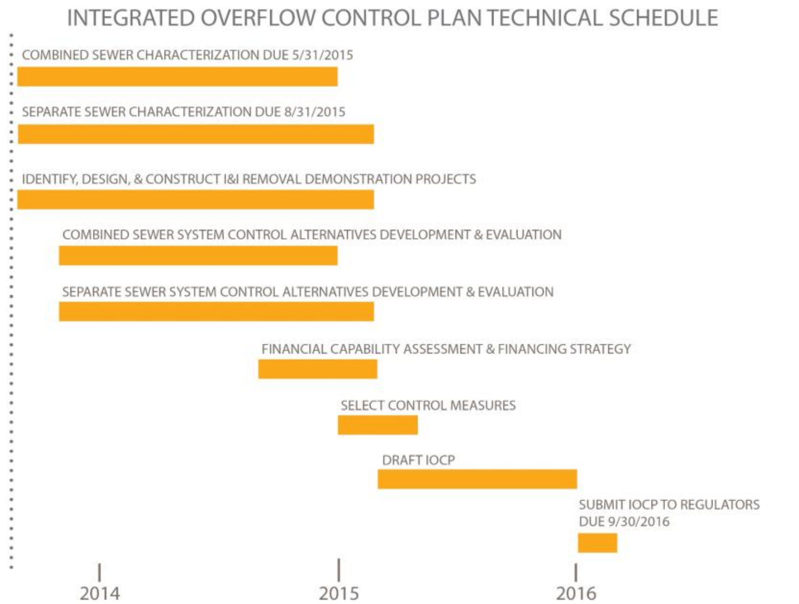

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Integrated Overflow Control Program
Neighbors Who Care Presentation

March 15, 2016

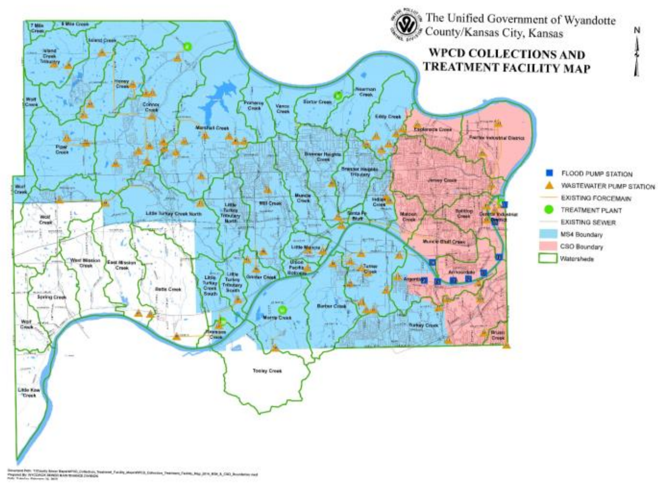
Agenda

- What is the problem?
- Who is involved?
- How can we reduce overflows in a way that our community can afford?
- What will our plan look like?
- What questions do you have?

What is the problem?

Our Sewer System

- **Combined Sewer System**
- **Separate Sewer System**



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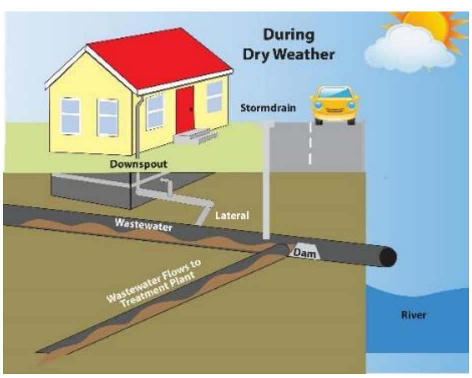
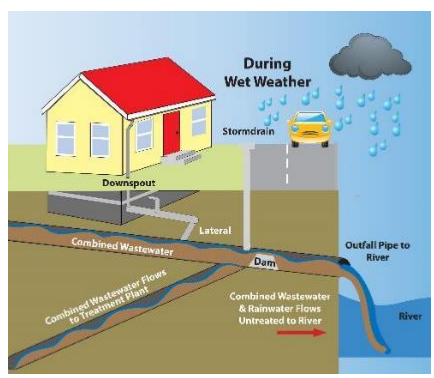
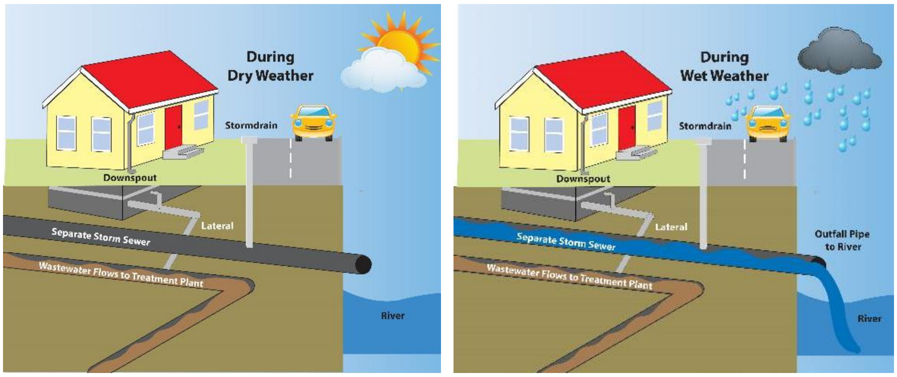




Separate Sewer System



Combined Sewer Overflows

- Overflows at outfalls into rivers and streams
- *Diluted* sewage
- We are required to *reduce*

Separate Sewer Overflows

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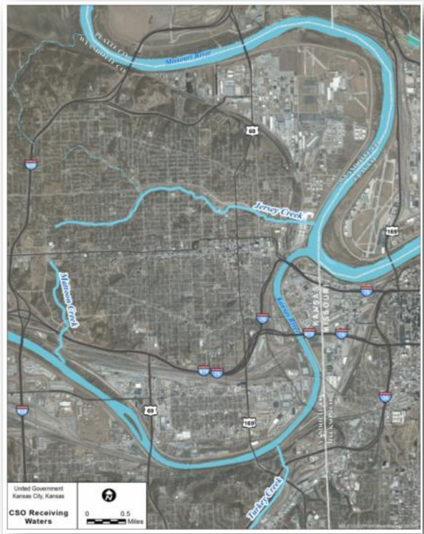

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Combined Sewer System Communities

~800
combined sewer system communities

164
of the large CSO communities have addressed sewer overflows

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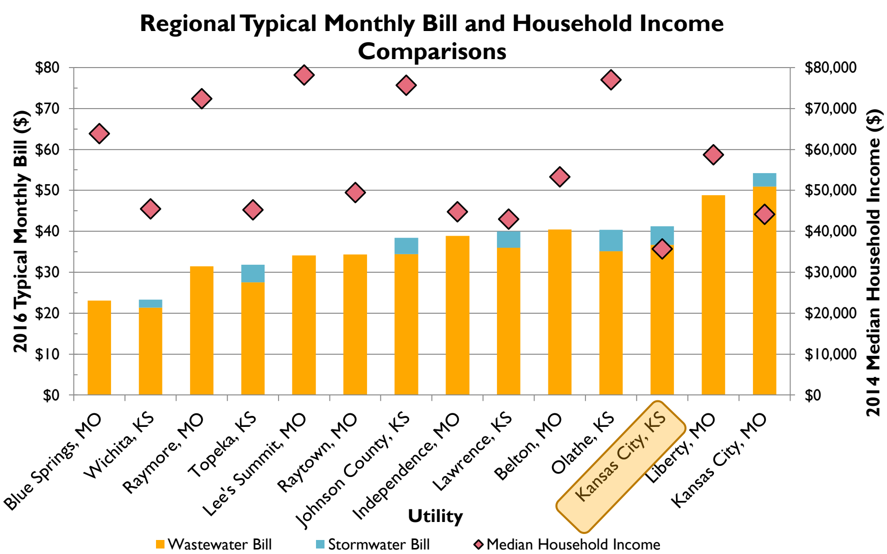
How can we reduce overflows in a way that our community can afford?

Regional Sewer Bill and Income Comparisons



Finding the Right Plan for Our Community

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communities that have extended their compliance timeline due to the cost of their program

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09/26/2012 10:36 pm ET | Updated Sep 27, 2012

Home » News » Environment

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GOVERNMENT & POLITICS APRIL 7, 2016 5:47 PM

KC water, sewer rates continue to rise

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas •

What will our Plan look like?

Types of Projects

- Construct a new wastewater treatment plant
- Investigate and repair our sewer pipes across the community
- Upgrade technology throughout our facilities
- Install green infrastructure near Big 11 Lake
- Maintain our existing sewer pipes and facilities

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

What questions do you have?

Thank You!

Integrated Overflow Control Program
Neighbors Who Care Presentation

May 9, 2016

Agenda

- What is the problem?
- Who is involved?
- How can we reduce overflows in a way that our community can afford?
- What will our plan look like?
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What is the problem?

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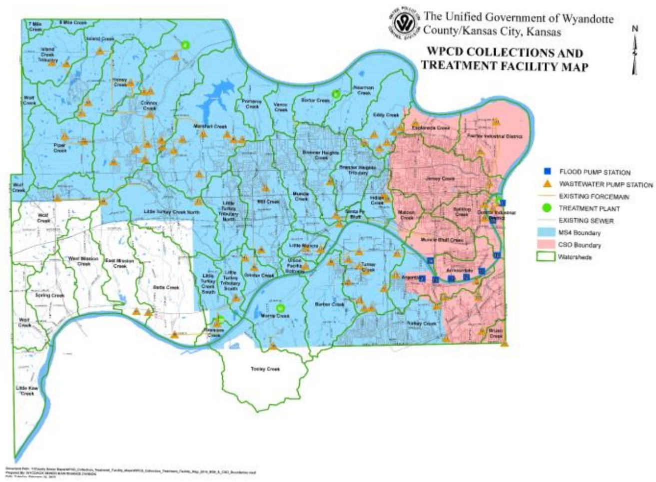
Combined Sewer System

Separate Sewer System



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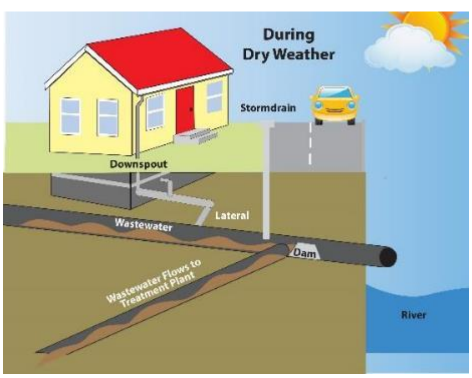

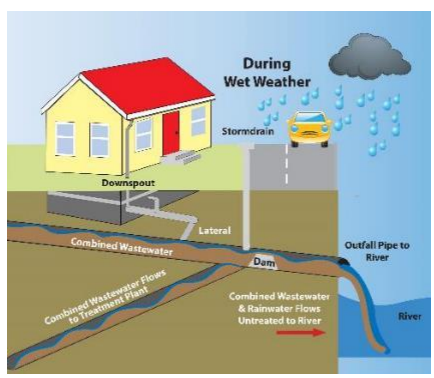

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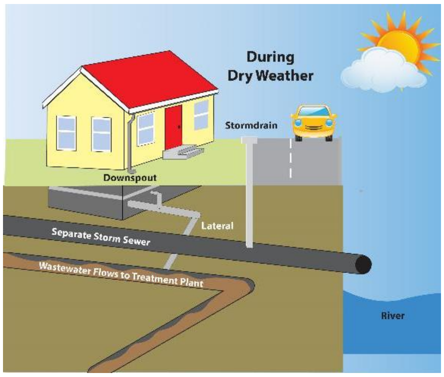

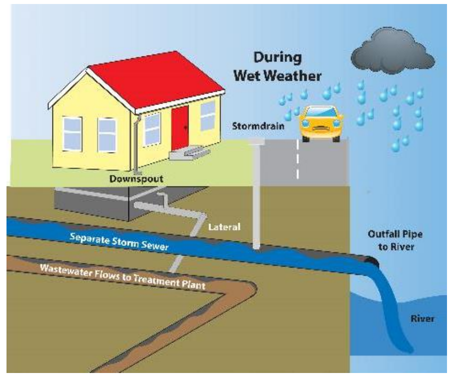

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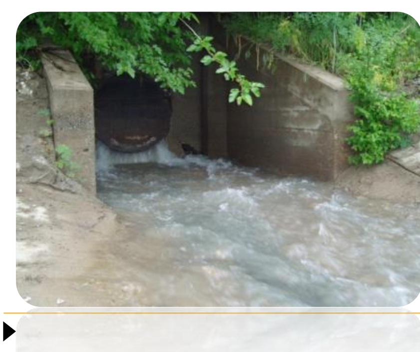

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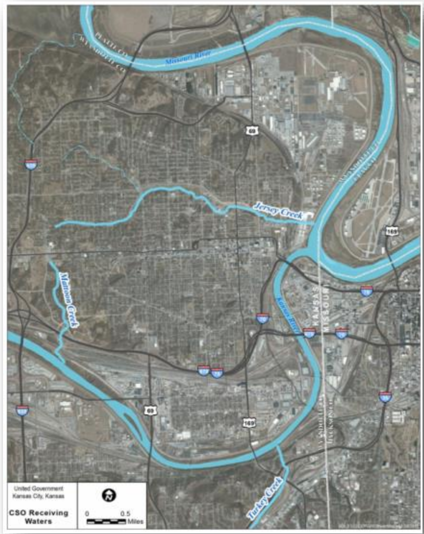

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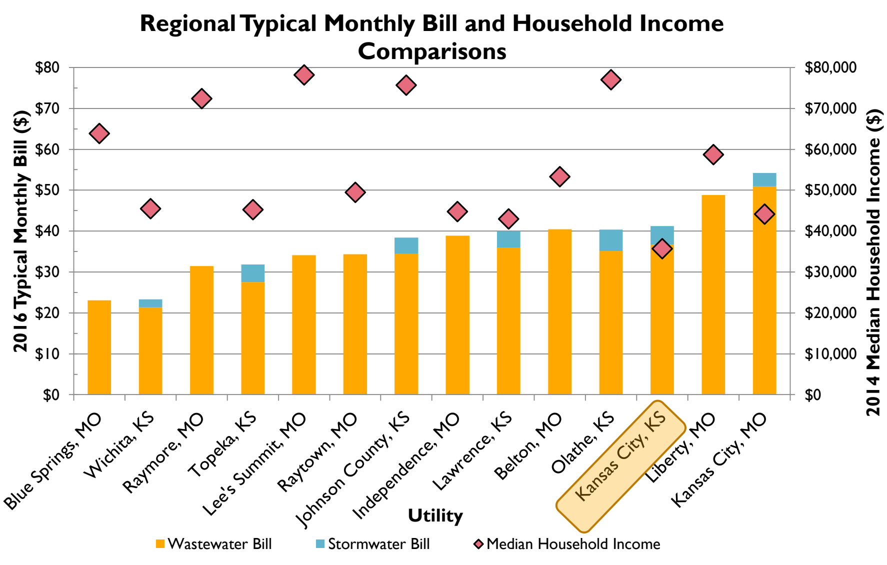

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How can we keep our investment within our community?

Entry Level Positions

- General Maintenance Worker
- Sewer Maintenance Worker I
- Construction Worker I

Necessary Entry Level Skills
High School Diploma or equivalent GED
Some experience in routine maintenance tasks
Commercial Drivers License (within 6 months of hire)
Must Pass Physical Exam and Drug Screen

Resources

- Job Postings
  - Job Information Line: 913-573-5688
  - www.wycokck.org/jobs/
  - UG is an Equal Opportunity Employer
- Assistance
  - Workforce Partnership
  - Johnson County Community College
  - Kansas City, Kansas, Community College
  - Eligible Training Providers
  - Work for Water

What do you think?

Your Input is Important to Us!

- Please take a moment to complete our Community Survey

You can also find the survey online at:
UGIOCP.com

What questions do you have?

Thank You!

Integrated Overflow Control Program
Kensington Community Presentation

May 24, 2016

Agenda

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- Who is involved?
- How can we reduce overflows in a way that our community can afford?
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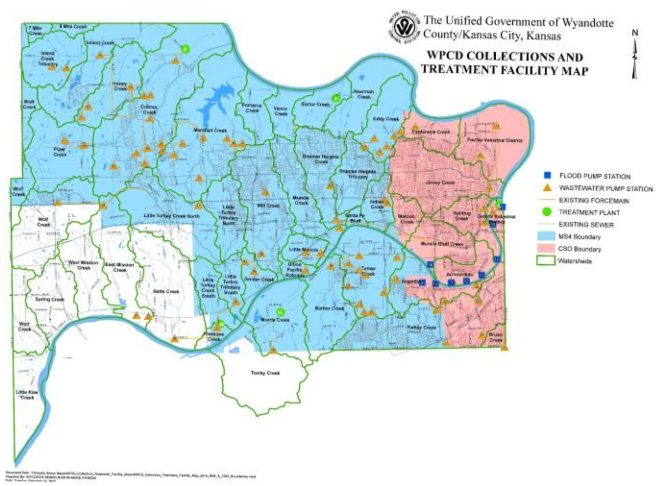
Combined Sewer System

Separate Sewer System



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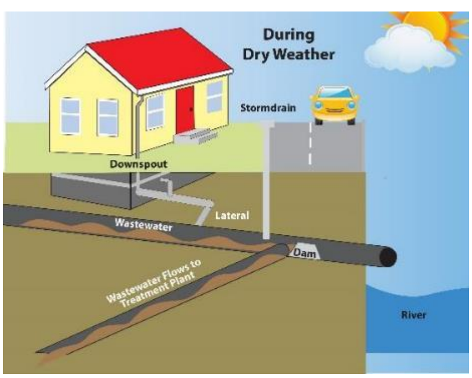

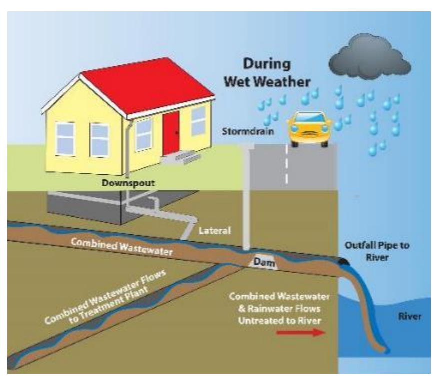

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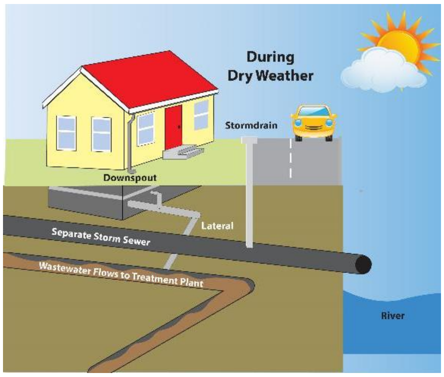

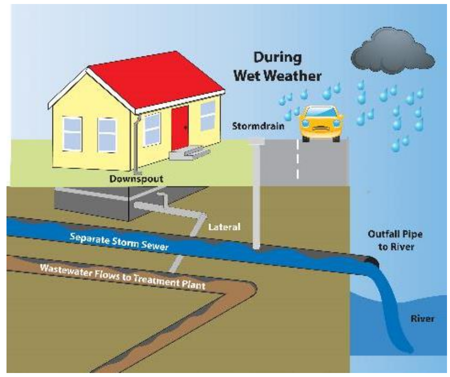

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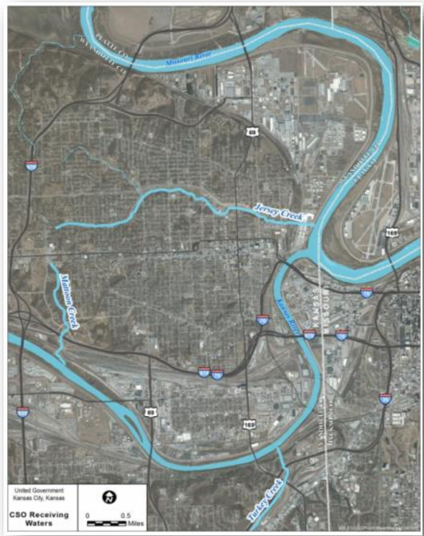

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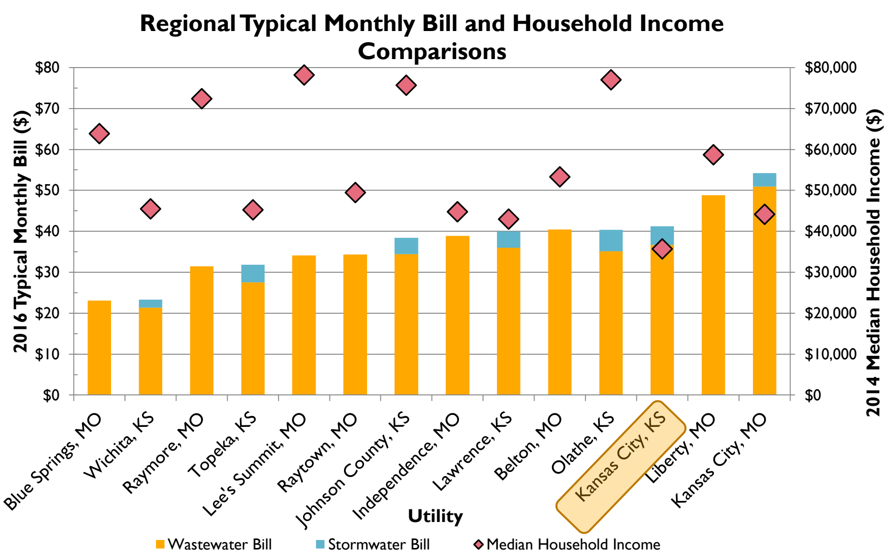

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- We believe our Plan is the most effective and affordable plan for our community

We Are Not Alone

4

communities that have extended their compliance timeline due to the cost of their program

8

communities have reopened their consent decrees due to financial constraints

Sewage Pollution Still Fouling Waterways As Clean Water Act Turns 40

09/26/2012 10:36 pm ET | Updated Sep 27, 2012

Home » News » Environment

Columbus to spend billions fixing waterlines, sewers

Water bills — and tempers — are rising in the Kansas City area

GOVERNMENT & POLITICS APRIL 7, 2016 5:47 PM

KC water, sewer rates continue to rise

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

What will our Plan look like?

Types of Projects

- Construct a new wastewater treatment plant
- Investigate and repair our sewer pipes across the community
- Upgrade technology throughout our facilities
- Install green infrastructure near Big 11 Lake
- Maintain our existing sewer pipes and facilities

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

What do you think?

Your Input is Important to Us!

- Please take a moment to complete our Community Survey

You can also find the survey online at:

UGIOCP.com

What questions do you have?

Thank You!

KENSINGTON COMMUNITY AREA WATCH- NEIGHBORHOOD MEETING

DATE: May 24, 2016

NAME	ADDRESS	PHONE	KCA W
Nona Moore	6246 Parallel Pkwy #214	(913) 334-9494	
Donnie Thomas	1726 N. 32nd St KC KS	913 708-1833	
Sylvia Wash	1614 N 40th S KC Ks	281-0878	
Elaine Ward	1835 No 27th	342-2164	
Waldo Marbheim	9400 Ward Parkway	816-844-4641	
Patrick Bubino	1936 N. 27th Street	(913) 621-3563	
Pat Brunner	1729 N. 38th St	913-342-0625	
Erin Dougherty	12351 Lenexa, KS	913-248-9545	
Edward Tucker	111 N 86th St. KC Ks	913-788-5494	
Richard Mabry	P.O. Box 44410	913-481-9920	
Dr. K. Dunn	KCKPD	573-8748	
Linda Thomas	1928 N. 32 St		
Trenton Foglesong	12330 Hummelbank, KC KS	913-238-5049	
Pam Blood	2032 N. 32nd, KCK	913-371-7092	
Dusty Kline & Brandi	3200 Everett Ave	(913) 991-8487	
Mable Lowery	2509 N. 34th St	(913) 371-2654	
Lillian Hobbs	1851 Tennyson	913 371 2844	
René Roco	1318 N 29	342 1596	

Integrated Overflow Control Program
Block Hawks Presentation

June 7, 2016

Agenda

- What is the problem?
- Who is involved?
- How can we reduce overflows in a way that our community can afford?
- What will our plan look like?
- How can we keep our investment within our community?
- How can I help?
- What questions do you have?
- What do you think?

UG Water Pollution Control Division

Wastewater (913) 573-5535

Stormwater (913) 573-5400

Board of Public Utilities (BPU)

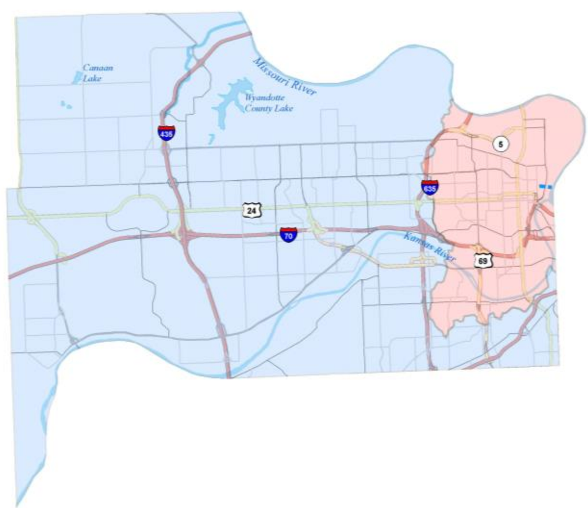
Drinking Water (913) 573-9622

What is the problem?

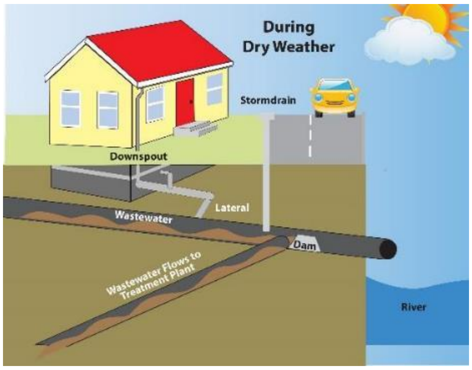
Our Sewer System

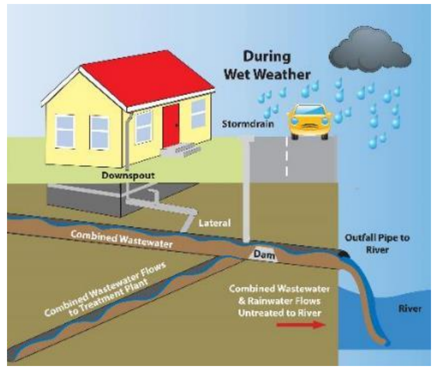
Combined Sewer System

Separate Sewer System

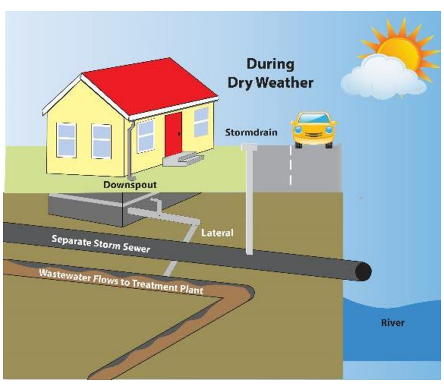


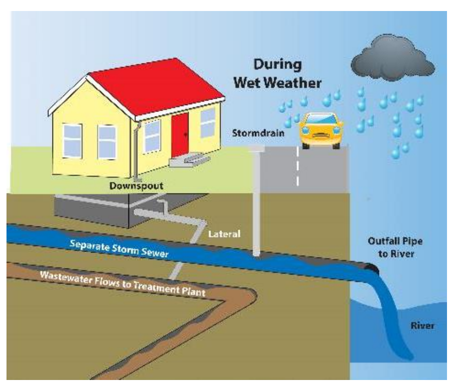
Combined Sewer System





Separate Sewer System





Combined Sewer Overflows

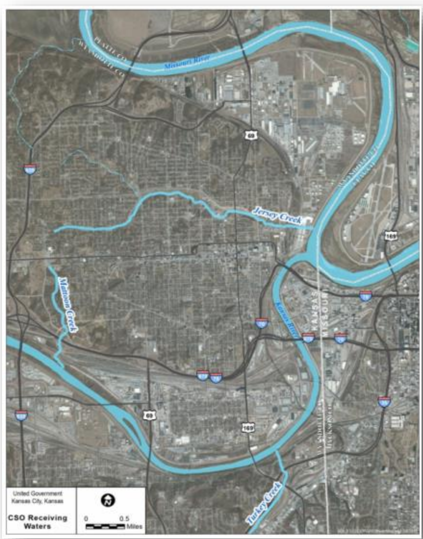
- Overflows at outfalls into rivers and streams
- *Diluted* sewage
- We are required to *reduce*

Separate Sewer Overflows

- Overflows at manholes and backups into basements
- *Concentrated* sewage
- We are required to *eliminate*

Water Bodies Where Sewers Overflow

- Kansas River (8 outfalls)
- Missouri River (6 outfalls)
- Mattoon Creek (2 outfalls)
- Jersey Creek (24 outfalls)



Who is involved?

The Regulatory Landscape

- All our work is regulated by the EPA and KDHE under the Clean Water Act (1972)
- Kansas City, like many major cities, is required to dramatically reduce sewer system overflows
- We are currently preparing a plan to meet regulatory requirements now and long into the future

Combined Sewer System Communities

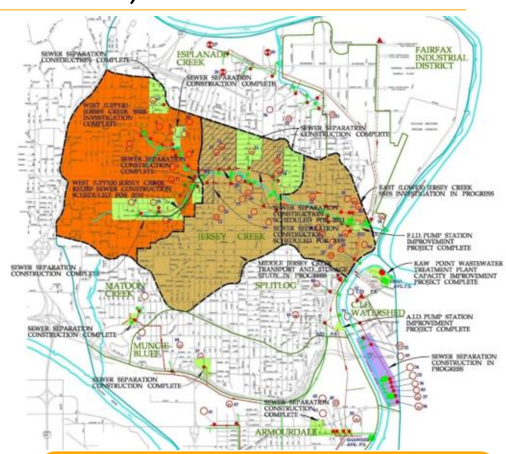
~800
combined sewer system communities

164
of the large CSO communities have addressed sewer overflows

17
communities are under enforcement by the EPA

Early Efforts (2000-2013)

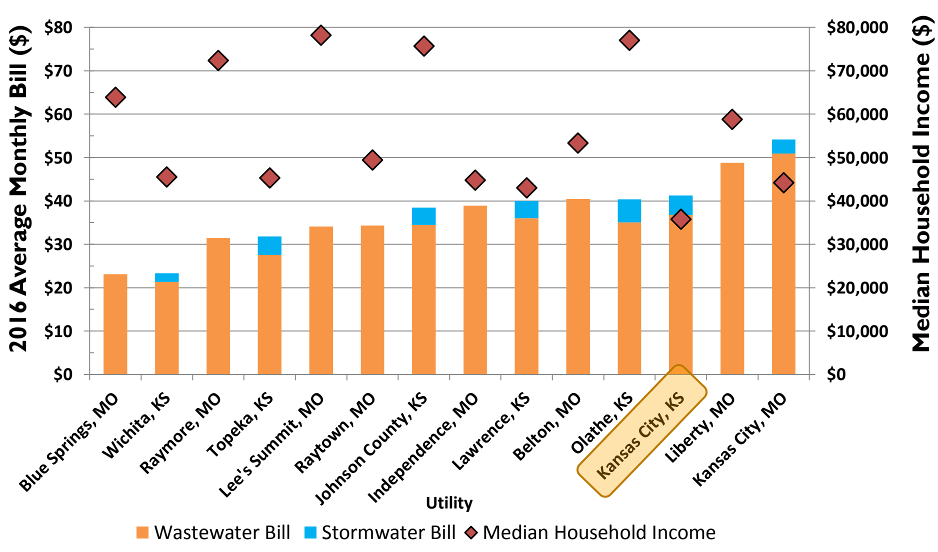
- Projects to reduce overflows
  - Jersey Creek sewer separation
  - Pump station improvements
  - Treatment plant improvements
- Field investigations and monitoring
- Rehabilitation and repair
- Maintenance



Reduced number of CSO outfalls from 66 to 40 and annual overflow volume by almost 20%!

How can we reduce overflows in a way that our community can afford?

Regional Sewer Bill and Income Comparisons



Finding the Right Plan for Our Community

- Focusing on fixing the pipes and facilities that we already have
- Learning more about how our system works so that we can make smart decisions
- Working toward reducing overflows to improve water quality and protect public health

Next Steps

- The Environmental Protection Agency (EPA) may not immediately approve our Plan
- Our Plan may require a legal process to reach an agreement with the EPA
- We believe our Plan is the most effective and affordable plan for our community

We Are Not Alone

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communities that have extended their compliance timeline due to the cost of their program

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Sewage Pollution Still Fouling Waterways As Clean Water Act Turns 40

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Columbus to spend billions fixing waterlines, sewers

Water bills — and tempers — are rising in the Kansas City area

GOVERNMENT & POLITICS APRIL 7, 2016 5:47 PM

KC water, sewer rates continue to rise

courier-journal 12:02 a.m. EDT May 21, 2016

MSD staff wants 20 percent rate increase

What will our Plan look like?

Types of Projects

- Construct a new wastewater treatment plant
- Investigate and repair our sewer pipes across the community
- Upgrade technology throughout our facilities
- Install green infrastructure near Big 11 Lake
- Maintain our existing sewer pipes and facilities

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

How can we keep our investment within our community?

Entry Level Positions

- General Maintenance Worker
  - $17.30/hour
- Sewer Maintenance Worker I
  - $20.34/hour
- Construction Worker I
  - $20.82/hour

Necessary Entry Level Skills
High School Diploma or equivalent GED
Some experience in routine maintenance tasks
Commercial Drivers License (within 6 months of hire)
Must Pass Physical Exam and Drug Screen

Resources

- Job Postings
  - Job Information Line: 913-573-5688
  - www.wycokck.org/jobs/
  - UG is an Equal Opportunity Employer
- Assistance
  - Workforce Partnership
  - Johnson County Community College
  - Kansas City, Kansas, Community College
  - Eligible Training Providers
  - Work for Water

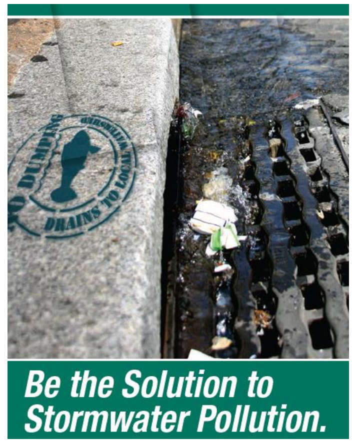
Work for Water
Water Environment Federation
the water quality people

How can I help?

See a problem? Call 913-573-5535

How can you protect your waterways?

- Rake away from curbside storm drains
- Wash your car in the grass or at a carwash
- Do not discard anything down a storm drain
- Pick up after your pets
- Help raise awareness



See a problem? Call 913-573-5400

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

What do you think?

Your Input is Important to Us!

- Please take a moment to complete our Community Survey

You can also find the survey online at:

UGIOCP.com

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

What questions do you have?

Thank You!

Presentation of WPA and Stormwater Fees on Monthly BPU Bill (Continued)

BPU Bill
(Back)

BPU GENERAL INFORMATION ABOUT YOUR BILL

CCF - Is the measurement of the amount of water used. One 'CCF' equals 100 cubic feet or approximately 750 gallons of water.

UNIFIED GOVERNMENT OF WYANDOTTE COUNTY/KANSAS CITY, KANSAS SERVICES
For questions pertaining to the UG charges listed below,
please call the Unified Government's 311 Call Center at 3-1-1 or 913-573-5311

PAYMENT IN LIEU OF TAXES (PILOT) - City ordinance requires BPU to pay a portion of its revenues to the UG to fund city operations. The UG sets this rate between 5 and 15 percent.

RESIDENTIAL TRASH FEE - BPU is the billing and collection agent for the Public Works Department of the Unified Government of Wyandotte County/Kansas City Kansas.

STORM WATER MANAGEMENT - BPU is the billing and collection agent for the Storm Water Management Fee for the Public Works Department of the United Government of Wyandotte County/Kansas City Kansas.

WATER POLLUTION ABATEMENT - BPU is the billing and collection agent for the Sewer Fee for the Public Works Department of the Unified Government of Wyandotte County/Kansas City Kansas.

WINTER AVERAGE - Residential Water Pollution Charges are based upon the average monthly water consumption for the period beginning December 1 and ending March 31 of the following year. The average for those months is the basis for the next twelve months.

Block Hawks N'hood Assn.

DATE: 6/7/2016.

EVENT: JUNE MEETING

Guest Speaker

Name	Address	Phone Number
Teddi Scott	4917 WAVERLY KCKS 66104	(913) 287-6567 ✓
ESCO A. HOLLINS	4930 WAVERLY AVE KCKS 66104	913 2875102
LARRY MARCHIN	2023 N 49 TERR. KCK 66104	(913) 287-4239
Louisa Glenda Hughes	4721 Haskell Ave KCKS 66104	913 709 4548
Norma Ragsdale	5000 Greeley K.C.K. 66104	913-287-4338
Robin Corbett	5000 GREELEY	816-813-9928
EUNICE BRADLEY	2301 N. 51st ST KCKS 66104	(913) 710-1195
Christina Morales	2324 N 51st ST KCKS 66104	913 710-3345
Joe Moreno	" "	" " "
DALE MARSHEIM	9400 WARD PARKWAY, KCMO	816-844-4641
Erin Dougherty	12351 W 76th Terrace Lenexa, KS 66215	(760) 802-2411 (cell)
Georgia Taylor	5021 Greeley KCKS 66104	913-596-1116
LEO SRUBAS	5005 GEORGIA AVE KCK 66104	
Lodean Covington	5015 Georgia Ave KCKS 66104	913 485-1586
SANDY ZICKO	5047 HASKELL K.C.K. 66104	913-287-3779

Appendix J –
Community Survey

Tell Us What You Think

Part of our original sewer system was built over 100 years ago, and some of this pipe is still in use today. When it rains, rainwater can get into our sewer system through storm drains and cracks in the pipes. This results in sewer overflows, which release a mixture of rainwater and sewage into our environment.

The Integrated Overflow Control Plan will focus on fixing our aging pipes and facilities to reduce sewer overflows and improve the reliability of our sewer system.

After you fill out your survey, fold the paper back into thirds, seal it with a piece of tape, and drop it in the mail.

The postage has already been paid for you.

Your input into this plan is valuable.

We are taking proactive steps to prepare a plan that meets the regulations, but more importantly, meets the needs of our community.

Unified Government of Wyandotte County
and Kansas City, Kansas
Integrated Overflow Control Plan
(913) 573-5700
www.wycokck.org/pw
Email: IOCP@wycokck.org

To:
Water Pollution Control Administration Building
50 Market Street
Kansas City, KS 66118

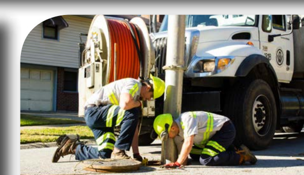
INTEGRATED OVERFLOW CONTROL PLAN

Community Survey

Unified Government of Wyandotte County
and Kansas City, Kansas

Take the Survey Online at: UGIOCP.com

(913) 573-5700
Email: IOCP@wycokck.org



1 Our community faces many other challenges in addition to our aging sewer system. We want to know how important this issue is compared to other issues in the community.

By checking the boxes below, choose THREE of the issues most important to you (choose three).

- ☐ Air Quality
- ☐ Public Health (teen pregnancy, obesity, smoking, etc.)
- ☐ Drinking Water Quality
- ☐ Economic Development
- ☐ Education
- ☐ Job Opportunities
- ☐ Maintain Existing Infrastructure (roads, bridges, sewers)
- ☐ Public Safety
- ☐ Transportation Options (buses, cars, bicycles, etc.)
- ☐ Water Quality (streams, lakes, and rivers)

2 Do you or your family members swim or wade in these water bodies? Check all that apply.

- ☐ Big II Lake
- ☐ Jersey Creek
- ☐ Kansas River
- ☐ Mattoon Creek
- ☐ Missouri River
- ☐ Wyandotte County Lake
- ☐ Other: ___________
- ☐ I do not swim or wade in any of these water bodies

3 Do you or your family members boat, canoe, or fish on these water bodies? Check all that apply.

- ☐ Big II Lake
- ☐ Jersey Creek
- ☐ Kansas River
- ☐ Mattoon Creek
- ☐ Missouri River
- ☐ Wyandotte County Lake
- ☐ Other: __________
- ☐ I do not boat, canoe, or fish on any of these water bodies

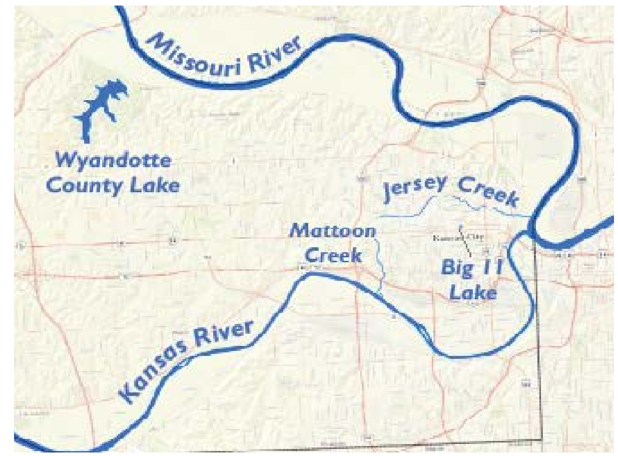
Digital image, KC Levee Trail, Web. 9 Feb. 2016

Digital image, twolfgdcwordpress.com, Web. 9 Feb. 2016

4 Do you or your family members hike, walk, bike, camp, or participate in social events along or on the banks of these water bodies? Check all that apply.

- ☐ Big II Lake
- ☐ Jersey Creek
- ☐ Kansas River
- ☐ Mattoon Creek
- ☐ Missouri River
- ☐ Wyandotte County Lake
- ☐ Other: __________
- ☐ I do not participate in activities near these water bodies

5 The map below shows a few of the water bodies you may know. We are curious to know which one you think is the most important to keep clean. Tell us which water body is the single most important to you and why?



____

____

____

____

6 State your level of agreement with the following statement: *Investments made to improve our wastewater system should not only consider the environment, but also the financial ability of citizens to pay for the improvements.*

- ○ Strongly Agree
- ○ Agree
- ○ Disagree
- ○ Strongly Disagree
- ○ I Need More Information

Appendix K –

Public Meeting Presentation and Sign-In Sheets

Integrated Overflow Control Plan
Public Meeting

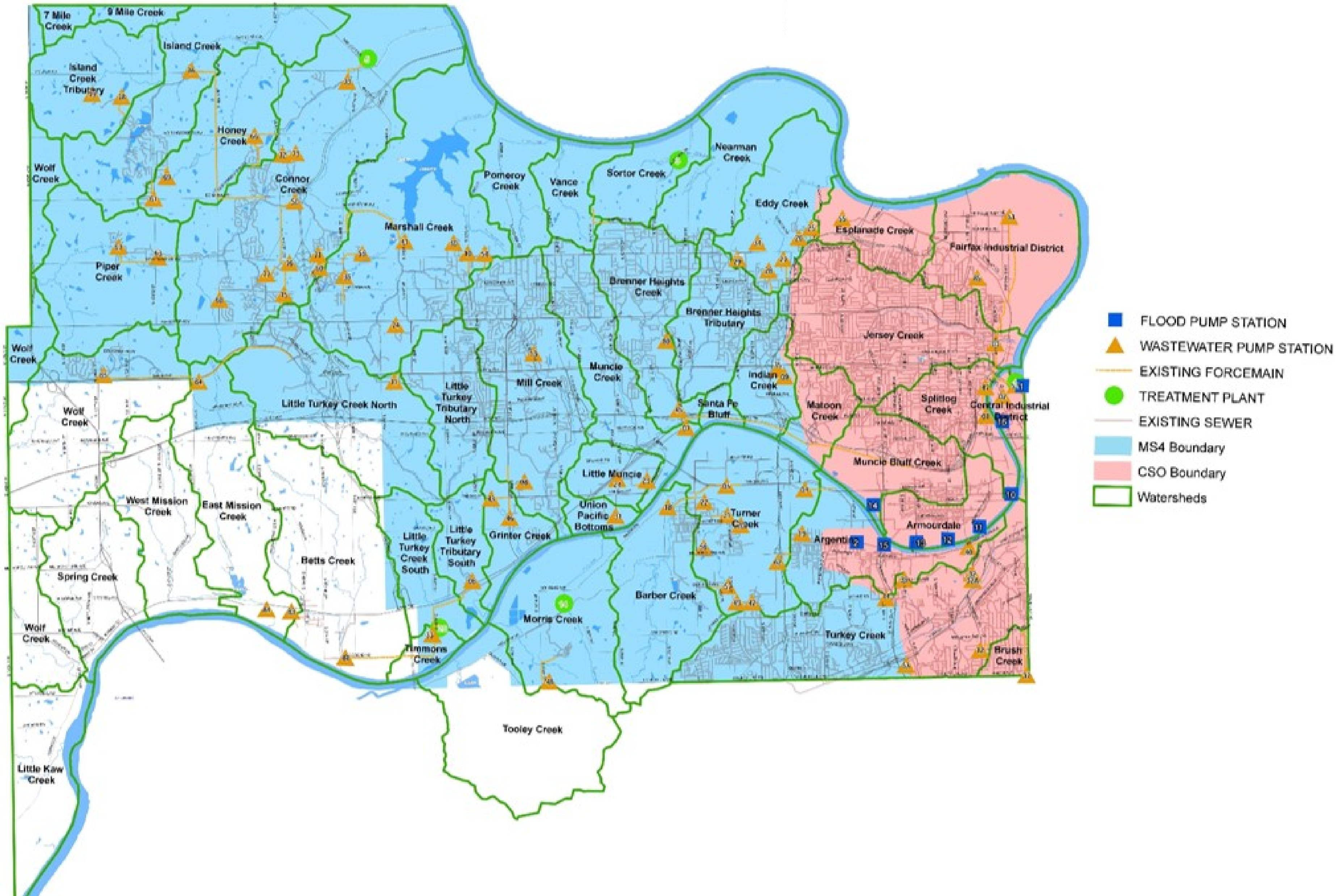
August 1, 2016

Agenda

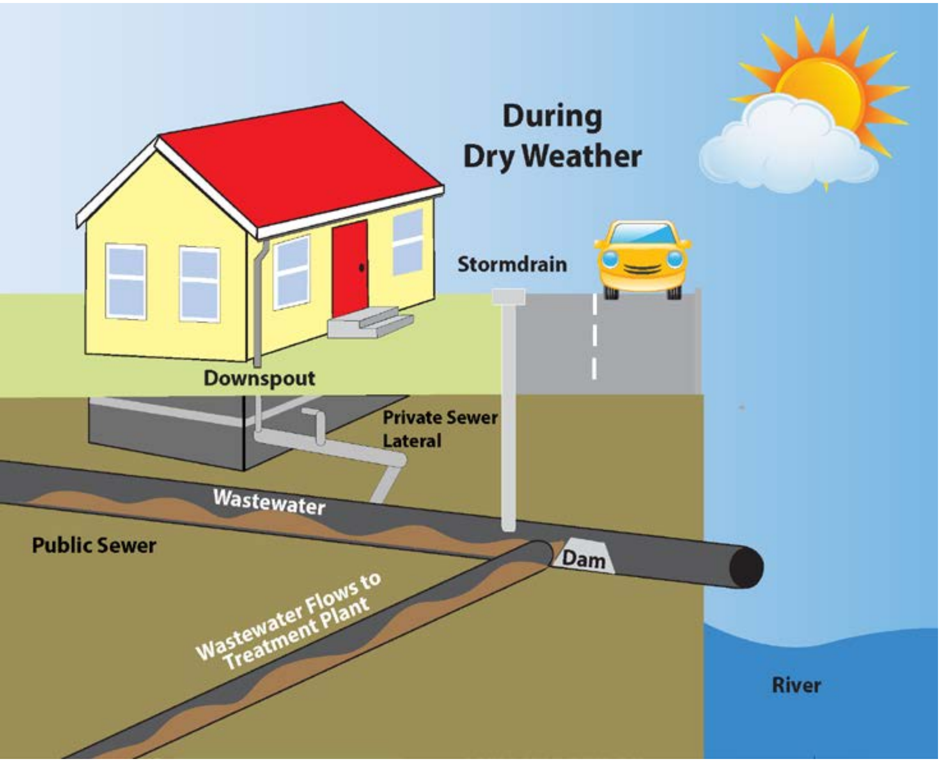
- What's the problem?
- What's the plan?
- How does this impact my sewer bill?
- How can I help?
- What do you think?

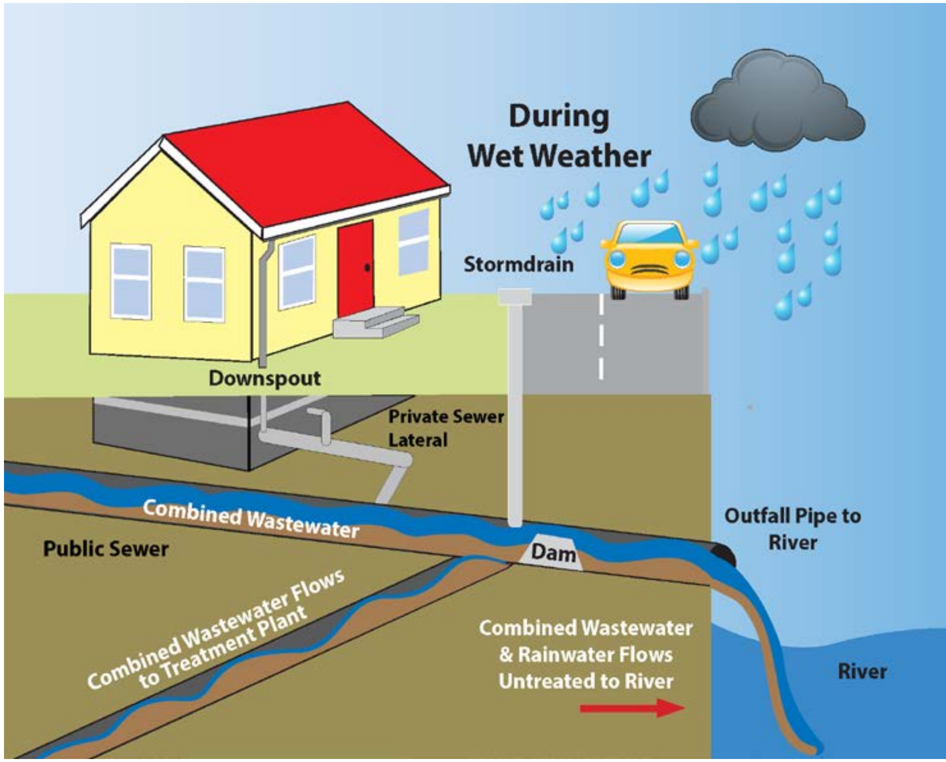
What’s the problem?

Our Sewer System

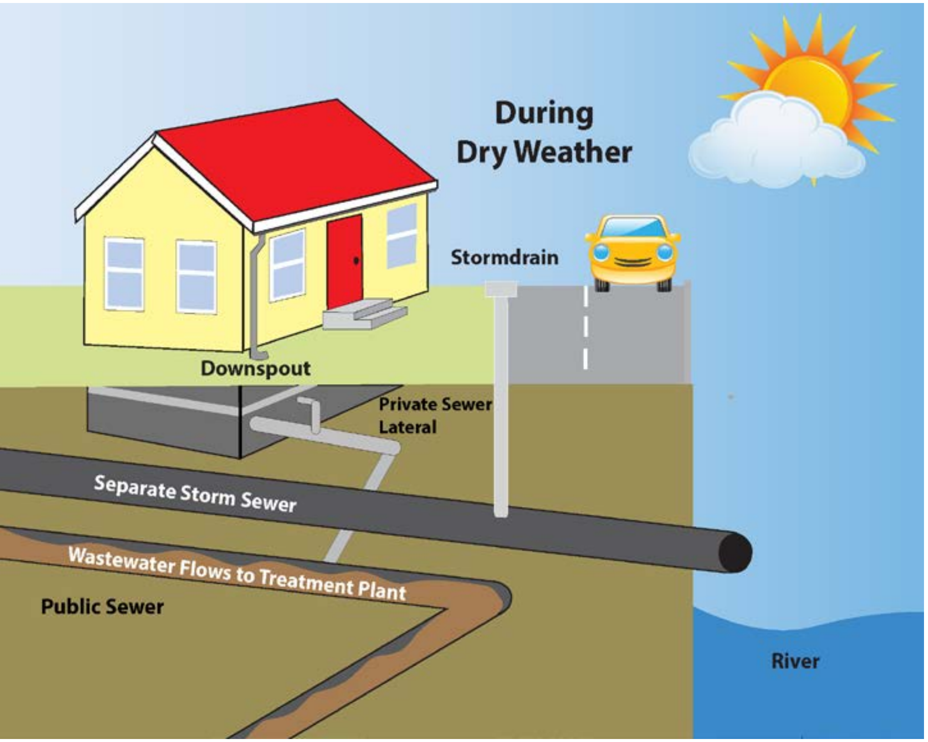


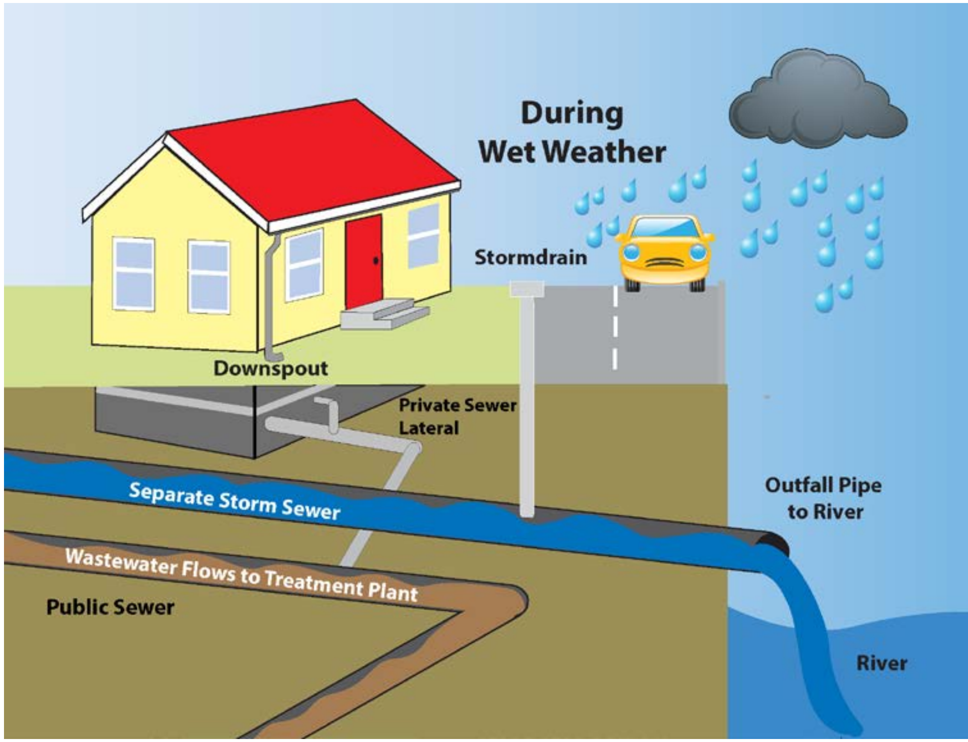
Combined Sewer System





Separate Sewer System





Combined Sewer Overflows

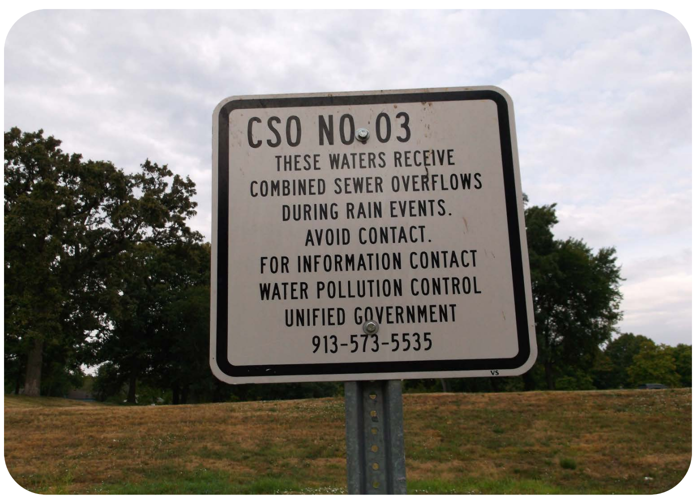
- Overflows at outfalls into rivers and streams
- More *Diluted* sewage
- We are required to *reduce*

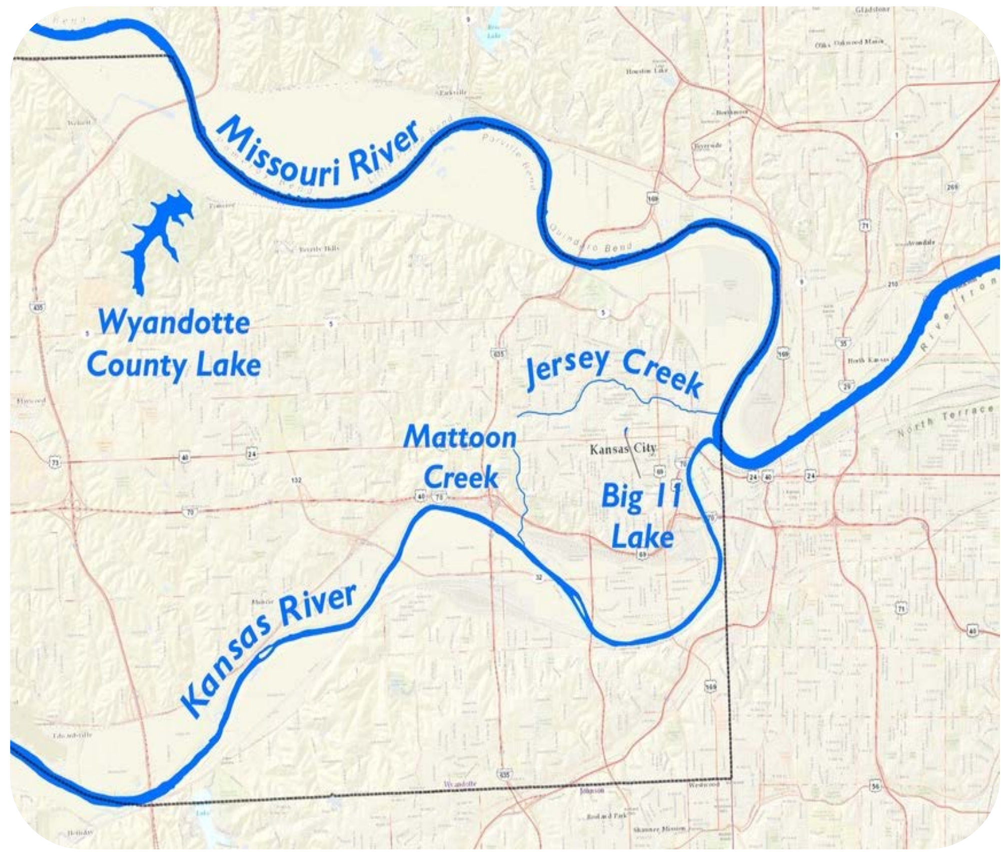
Separate Sewer Overflows

- Overflows at manholes and backups into basements
- Diluted sewage
- We are required to *eliminate*

Waterways Where Combined Sewers Overflow

- Kansas River (7 outfalls)
- Missouri River (6 outfalls)
- Mattoon Creek (2 outfalls)
- Jersey Creek (24 outfalls)





Aging Infrastructure

- Leaking Pipes
- Basement Backups
- Collapsed Pipes




Plan Required

- All of our work is regulated by the EPA and KDHE under the Clean Water Act (1972)
- Kansas City, like many major cities, is required to dramatically reduce sewer system overflows
- We are recommending a plan that makes continued progress towards meeting the goals of the Clean Water Act

Progress Since 2000

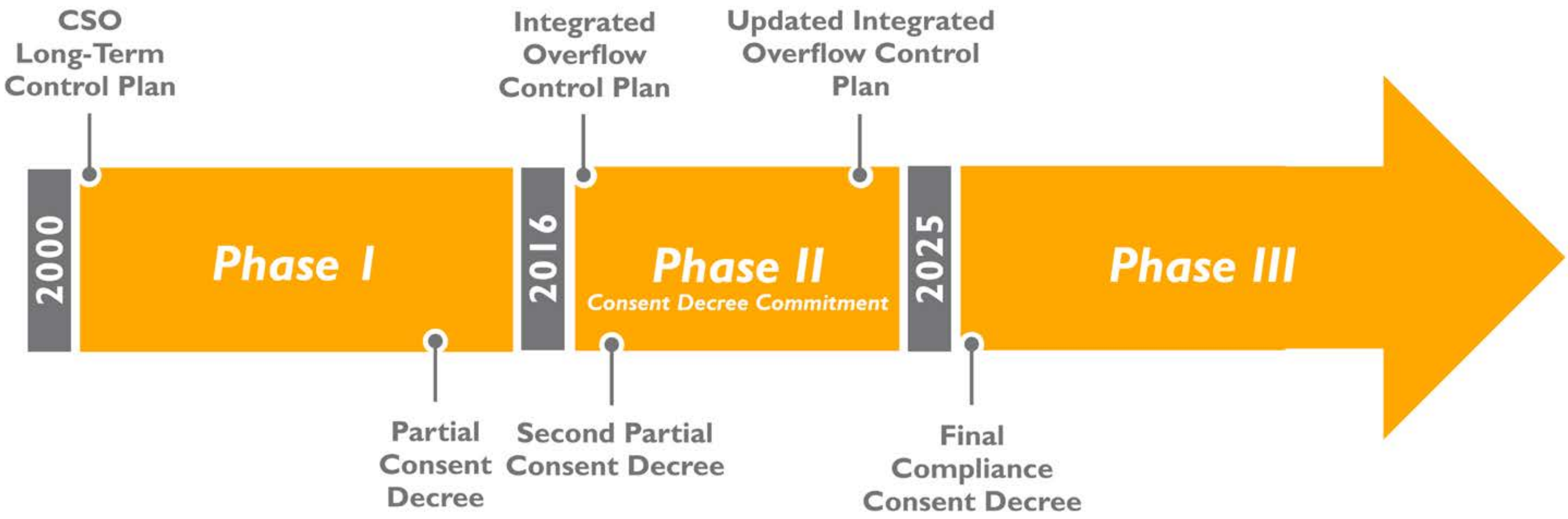
- Major projects to reduce overflows
- Field investigations and monitoring
- Rehabilitation and repair
- Maintenance

Reduced number of locations from 66 to 48

Decreased annual overflow volume by almost 20%!

What’s the plan?

Proposed Schedule



Community Input

- 24 Presentations to Neighborhood Groups
- Community Task Force
- Community Survey
- 3 Public Meetings
- Website
- Brochures
- Video

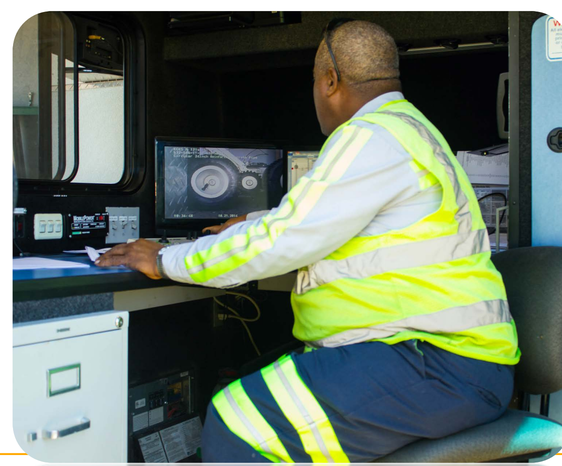
What We Heard

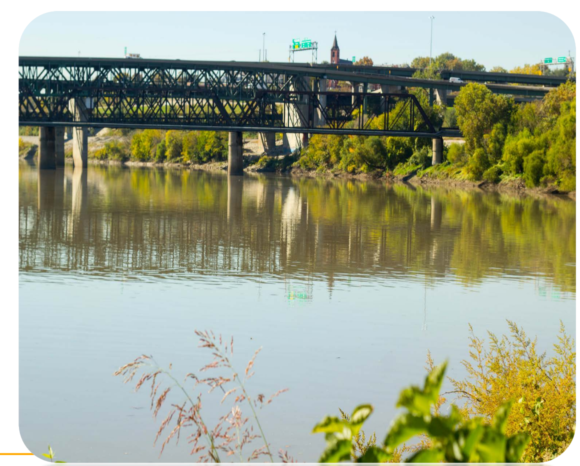
- Citizens want the most affordable plan
- Fix existing sewer system

Wyandotte County citizens believe that maintaining our existing infrastructure is a top priority for the community

Recommended 10-Year Plan

- Focusing on fixing the pipes and facilities that we already have
- Learning more about how our system works so that we can make smart decisions
- Working toward reducing overflows to improve water quality and protect public health



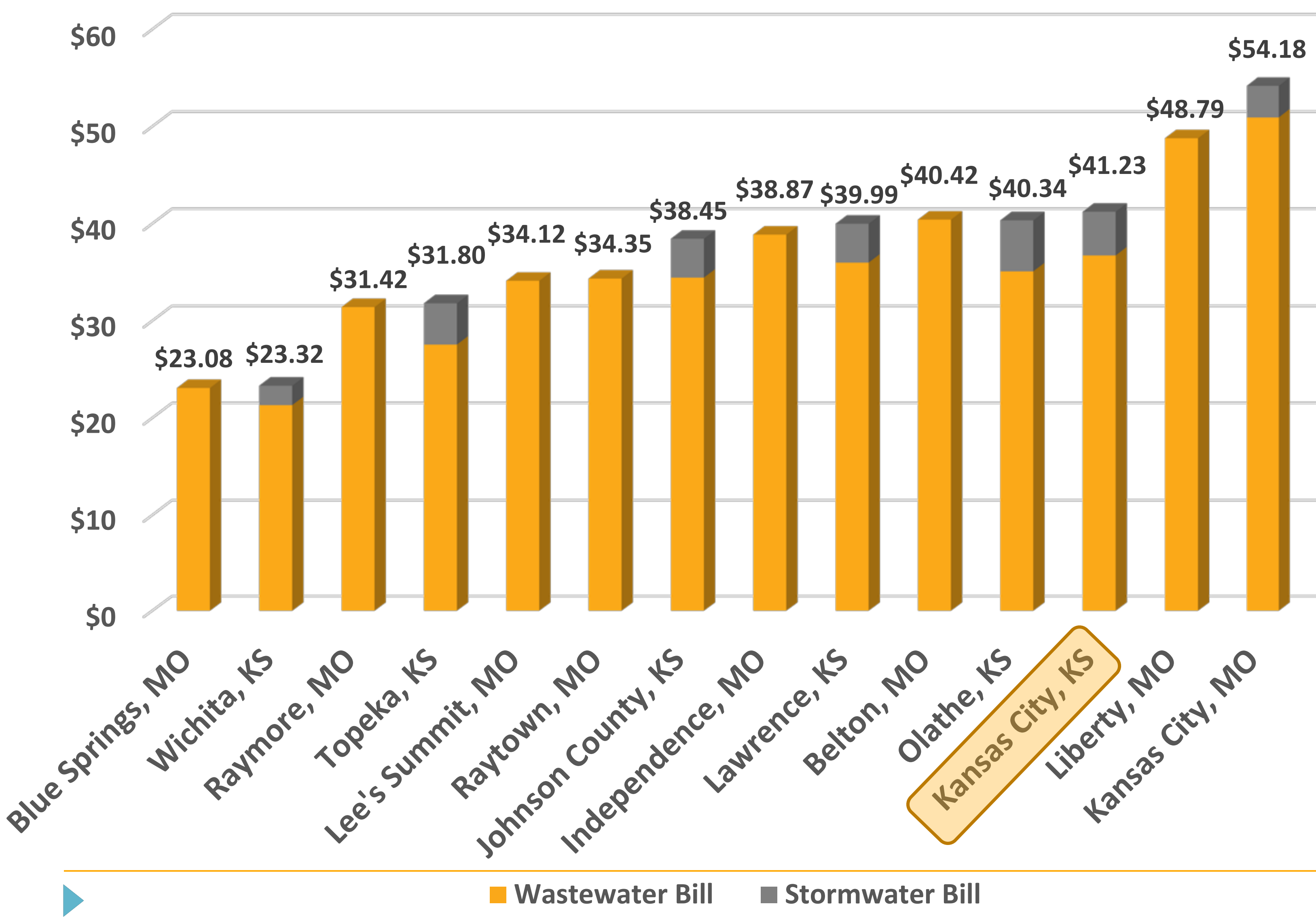


Recommended $200 Million Plan

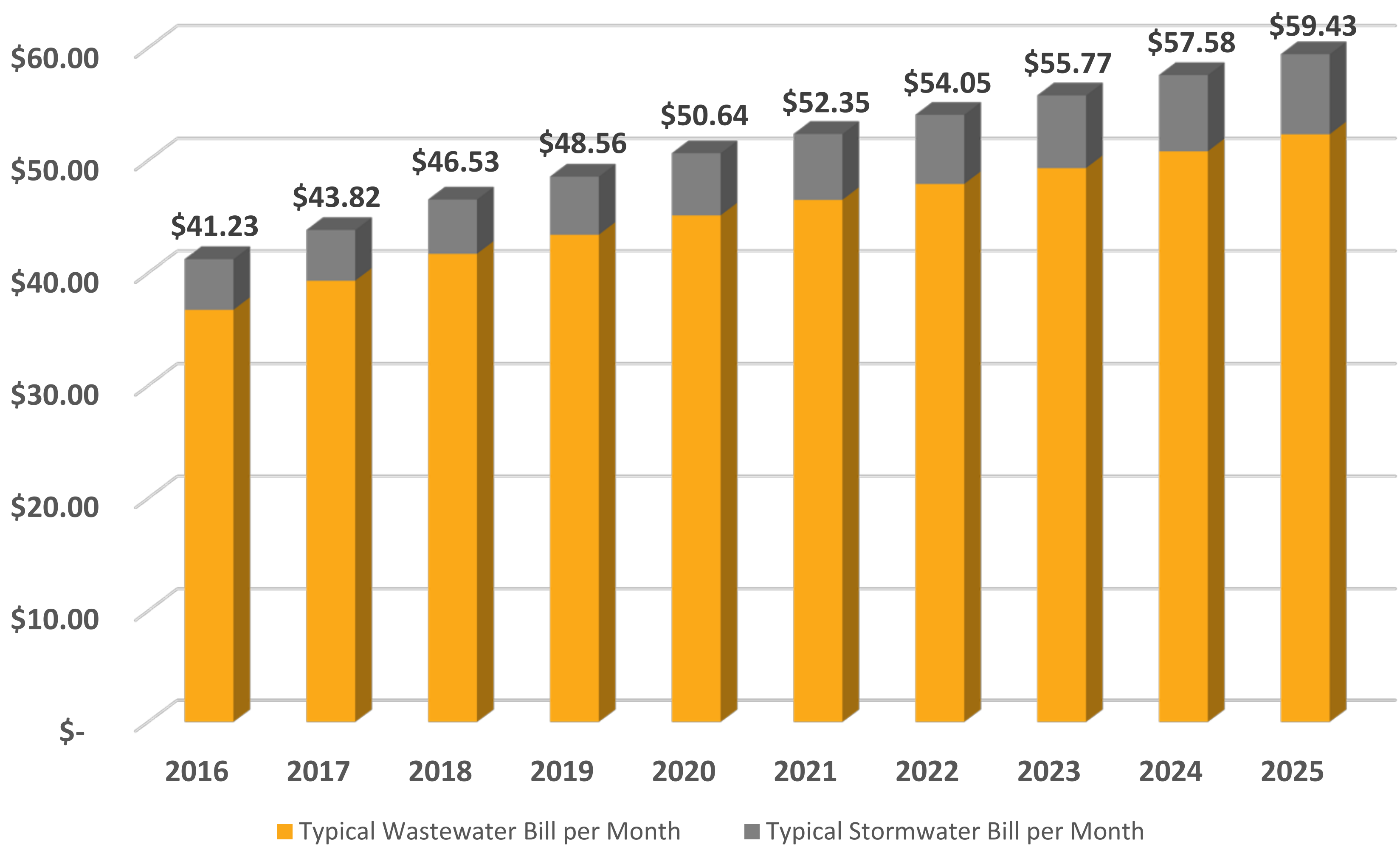
- Investigate and repair existing sewer pipes
- Upgrade technology throughout facilities to monitor the system
- Construct a new wastewater treatment plant
- Reduce rainwater getting into combined sewers by repairing pipes and installing green infrastructure
- Increase maintenance of existing sewer pipes and facilities

How does this impact my sewer bill?

Regional Bill Comparison



Projected Typical Monthly Bill



Your monthly bill will increase by about $2 each year for the next 10 years

Next Steps

- Approval of the Recommended Plan by UG Commissioners
- We will work with the EPA and Department of Justice to reach an agreement
- We believe our Recommended Plan is the most effective and affordable plan for our community

PLAN IS DUE

SEPTEMBER 30, 2016

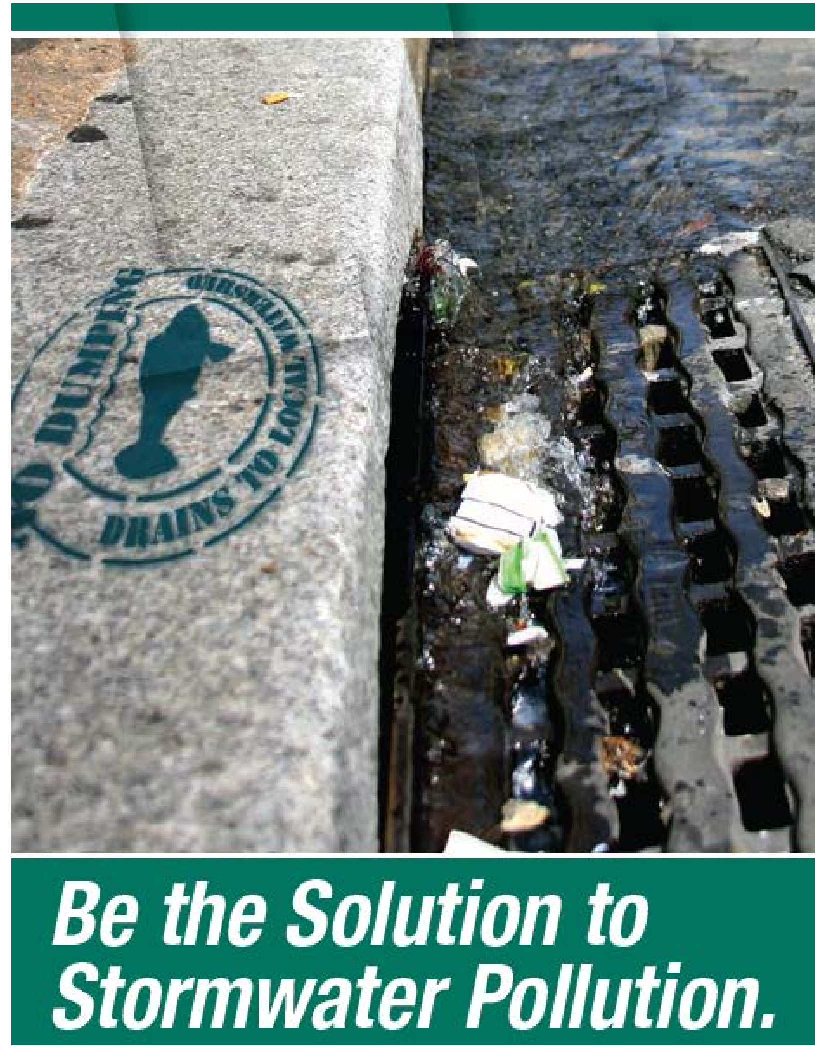
How can I help?

TOILETS ARE NOT TRASHCANS™

See a problem? Call 913-573-5535

How can you protect your waterways?

- Rake away from curbside storm drains
- Wash your car in the grass or at a carwash
- Do not discard anything down a storm drain
- Pick up after your pets
- Help raise awareness



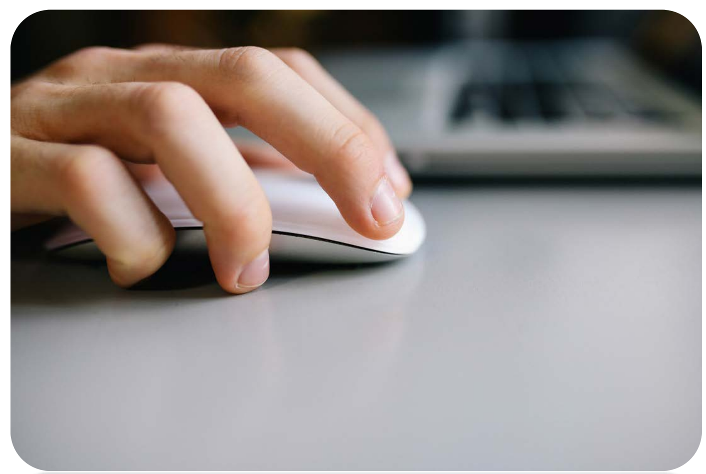
What do you think?

Your Input is Important to Us!

- Please take a moment to complete our Community Survey (closes August 5th)
- Please fill out a comment card

You can also find the survey online at:

UGIOCP.com



Need More Information?

- **For questions or concerns:**
  - **Call (913) 573-1333**
  - **Email IOCP@wycokck.org**
- **Follow us for updates!**

@CityofKCK

Facebook.com/CityofKCK

For general information, visit our website: UGIOCP.com

INTEGRATED OVERFLOW CONTROL PLAN

PUBLIC MEETING #1 SIGN-IN SHEET

AUGUST 1, 2016 | 6:00 P.M. – 8:00 P.M. | REARDON CENTER

NAME	ADDRESS	PHONE NUMBER	EMAIL ADDRESS
John Monkhus	9109 Ann Ave KCK	913.573.5712	jmonkhus@wycokck.org
Joe Jennings	4600 Gortandekck	913-307-6982	NONE
KYLE TONJES	9450 Ward Pkwy	402-415-1175	kltonjes@burnsmcd.com
Andy Sauer	9450 Ward Parkway	(816) 448-3575	ansauer@burnsmcd.com
LUCAS GILLEN	1411 E 104th	(816) 874.4655	lgillen@trekkdesigngroup.com
DAN WELCH	6221 ARMSTRONG	(913) 788-5553	NØDDW@HOTMAIL.COM
Charlie & Betty Wells	3304 Kimball	913-342-5306	BETKCK44@Yahoo.Com
CHRIS BURNS	CDM SMITH	816-412-3172	BURNSCL@CDMSMITH.COM
Alyssa Carrodine		913 573 6751	acarrodine@wycokck.org
Josephine Richardson	7408 Greeley Ave	913-788-8743	N/A
Dorothy McField	3058 Parkwood Blvd	913 3426760	
Karla Malabre	3006 N. 10th	913 321-3250	

INTEGRATED OVERFLOW CONTROL PLAN

PUBLIC MEETING #1 SIGN-IN SHEET

AUGUST 1, 2016 | 6:00 P.M. – 8:00 P.M. | REARDON CENTER

NAME	ADDRESS	PHONE NUMBER	EMAIL ADDRESS
Nellie Styles	1883 North 38th St	913-321-0153	
WALDO MARGHEIM	9400 WARD Pkwy, KCMO	816-844-4641	wamargheim@burnsmcd.com
Ryan Eisele	3740 NE Troon DR, LS MO	816-347-1163	Ryan.Eisele@hdrinc.com
Josh Fedder	8400 Ward Pkwy	913-458-3685	fedderjl@bv.com
John Brummer	1411 E 104th	913 558 4671	jbrummer@trekkllc.com
Andrew McCarthy	915 N 82nd 212	913-230-2227	andrew34mccarthy@att.net
Norm Scott	501 N. 86th St.	913 645-8150	NKLJSCOTT@gmail.com
Kris Finger	701 N 7th street	913-573-5422	kfinger@wycokck.org
Dave Mikesic	4013 N 112 St	913-424-7771	
LENDRA AUSTIN	735 Waverley	913-208-7705	—
ELAINE WARD	1835 No. 27th	913-342-2164	—
DON MCCLAW	3712 WOOD AVE	913-621-6098	—

INTEGRATED OVERFLOW CONTROL PLAN

PUBLIC MEETING #1 SIGN-IN SHEET

AUGUST 1, 2016 | 6:00 P.M. – 8:00 P.M. | REARDON CENTER

NAME	ADDRESS	PHONE NUMBER	EMAIL ADDRESS
Ramon Murguia	2800 Strong KCK	913 432-2506	
Melissa McG[illegible]	817 N. 5th St.	913 484 3504	

UNIFIED GOVERNMENT • Wyandotte County • Kansas City, Kansas

INTEGRATED OVERFLOW CONTROL PLAN

PUBLIC MEETING #2 SIGN-IN SHEET

AUGUST 3, 2016 | 6:00 P.M. – 8:00 P.M. | DIANE KANE COMMUNITY CENTER

NAME	ADDRESS	PHONE NUMBER	EMAIL ADDRESS
Brandy Wells			bwells@wycokck.org
Stan & Donna Bartley		913-777-4406	admin@stanleyhousing.com
Christine Wheeler		9134246843	FOURWHEELS92@GMAIL.COM
MARVIN/LINDA JOHNS		913-721-2900	TEVINSGPA@GMAIL.COM
KYLE TONJES	9400 WARD PKWY	402-415-1175	kltonjes@burnsmcd.com

INTEGRATED OVERFLOW CONTROL PLAN

PUBLIC MEETING #2 SIGN-IN SHEET

AUGUST 3, 2016 | 6:00 P.M. – 8:00 P.M. | DIANE KANE COMMUNITY CENTER

NAME	ADDRESS	PHONE NUMBER	EMAIL ADDRESS
Don Van Dyke	10949 Miller Lane	913-721-5556	
Benita Hamilton	8108 Orville Ave	913 788-7464	~~bla~~ 786hamilton@gmail.com
Kevin D. Swearengin	UG	913-573-1365	KSWEARENGIN@WYCOKCK.ORG
Curtis Bock	4203 N 126 Terr	913 721-4688	
Wendy Green	UG	913-573-5679	wmgreen@wycokck.org
Waldo Margheim	9400 Ward Parkway	913-904-8314	wamargheim@burnsmcd.com
Jim Teaney	12328 Wingfoot Dr.	913-721-2192	jteaney9@gmail.com
Steve Roth	11010 Haskell Ave	913-213-5159	sroth@bereseh.com
Jackie Klapper	10825 Countryside Dr.	913-302-5105	jacqueliklapper3611@msn.com
Don Dumovich	3120 N. 121st St	913-721-2606	dumovichdon@yahoo.com
Sarah & Nathan White	11414 Yecker Ave	913-553-0794	sfjell@wycokck.org
Josh Tedder	8400 Ward Parkway	913-498-3685	tedderJ1@bv.com

INTEGRATED OVERFLOW CONTROL PLAN

PUBLIC MEETING #3 SIGN-IN SHEET

AUGUST 4, 2016 | 6:00 P.M. – 8:00 P.M. | SOUTH KANSAS CITY, KANSAS LIBRARY

NAME	ADDRESS	PHONE NUMBER	EMAIL ADDRESS
Lawrence Meisner	3619 County Line Rd	913 384 8748	
Nancy Meisner	"	"	marriedtopeaches@aol.com
Joe Davis	OP KS	913-851-9147	jtdavis@custom[illegible].com
Debbie Taylor	1141 S 48 [illegible]	287 8121	dreguido@Aol.Com
Andy Sauer			arsauer@burnsmcd.com
Loretta Escobar	1438 S. 25th St.	913-362-8957	
Mario Escobar	" "	" "	mario.escobar@ABC[illegible]gmail.com
Patrick [illegible]	1216 So 38 St	816-797-6146	KCK Brillo@yahoo.com
Patricia Runyon	1609 S 28th	816 810 5627	KC KS 66106
Don McCLAIN	3712 WOOD AVE	913-621-6028	————
Araceli Jurado	1716 Nebraska	913-602-2228	Celi_Jura@yahoo.com

INTEGRATED OVERFLOW CONTROL PLAN

PUBLIC MEETING #3 SIGN-IN SHEET

AUGUST 4, 2016 | 6:00 P.M. – 8:00 P.M. | SOUTH KANSAS CITY, KANSAS LIBRARY

NAME	ADDRESS	PHONE NUMBER	EMAIL ADDRESS
WALDO MARGHEIM	9400 WARD PARKWAY	913-904-8314	wamargheim@ burnsmcd.com
KYLE TONJES	9400 Ward Pkwy	402-415-1175	kltonjes@burnsmcd.com
Ryan Eisele	~~6900~~ 3240 NE Troon Dr	816-347-1103	Ryan.Eisele@hdrinc.com
Tam Grodsky			tamgrodsky@gmai
Pat Berry	1225 State	send email w/ detailed plan	ourcsa@gmail
Kelly Coyle	"		
Shelley Still	1207 S. 39th St	913-244-1959	shelleystill2014@yahoo.com

INTEGRATED OVERFLOW CONTROL PLAN

PUBLIC MEETING #3 SIGN-IN SHEET

AUGUST 4, 2016 | 6:00 P.M. – 8:00 P.M. | SOUTH KANSAS CITY, KANSAS LIBRARY

NAME	ADDRESS	PHONE NUMBER	EMAIL ADDRESS
Maria Rangel	911 So. 53rd Terr	913-573-6190	mariabTorres rangel@gmail
Christal Watson	8532 Spring Ave.	913-299-9321	cwatson.tbc@gmail

Appendix L –

Public Meeting Comment Card

INTEGRATED OVERFLOW CONTROL PLAN
PUBLIC MEETING COMMENT CARD

August 1, 2016 | 6:00 p.m. – 8:00 p.m. | Reardon Center

Your input is important to us!

Name ____________________ Email Address ____________________

Address ____________________ Phone Number ____________________

Do you have any questions or concerns about the Recommended Plan?

____

____

____

Do you agree with our Plan to prioritize the repair and renewal of the existing wastewater system?

☐ Yes

☐ No

Please Explain: ____________________

State your level of agreement with the following statement: *Investments made to improve our wastewater system should not only consider the environment, but also the financial ability of citizens to pay for the improvements.*

◯ Strongly Agree ◯ Agree ◯ Disagree ◯ Strongly Disagree ◯ I Need More Information

Please tell us how you found out about this meeting.

____